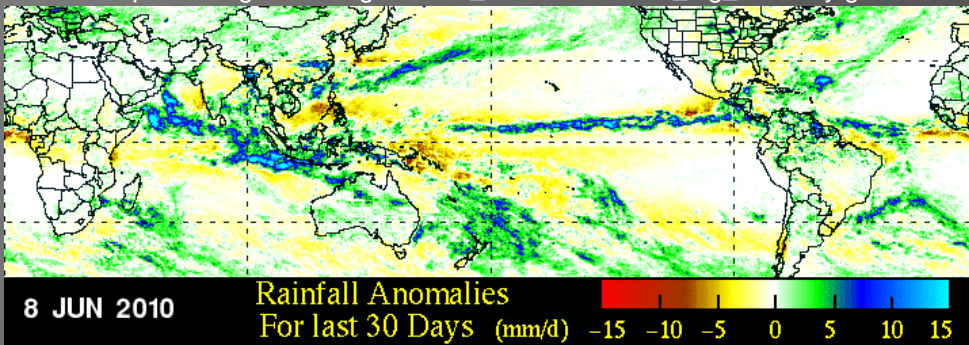
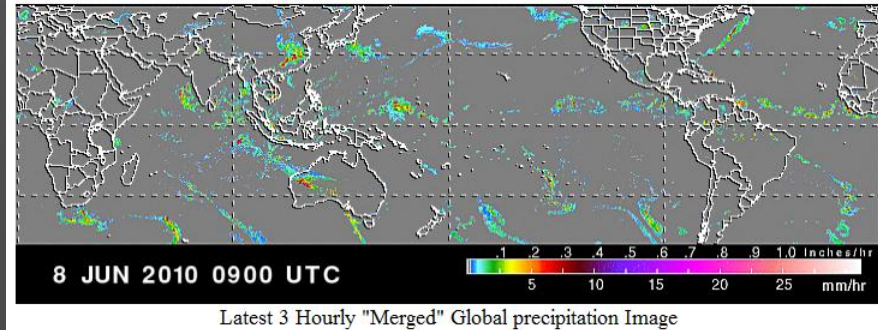
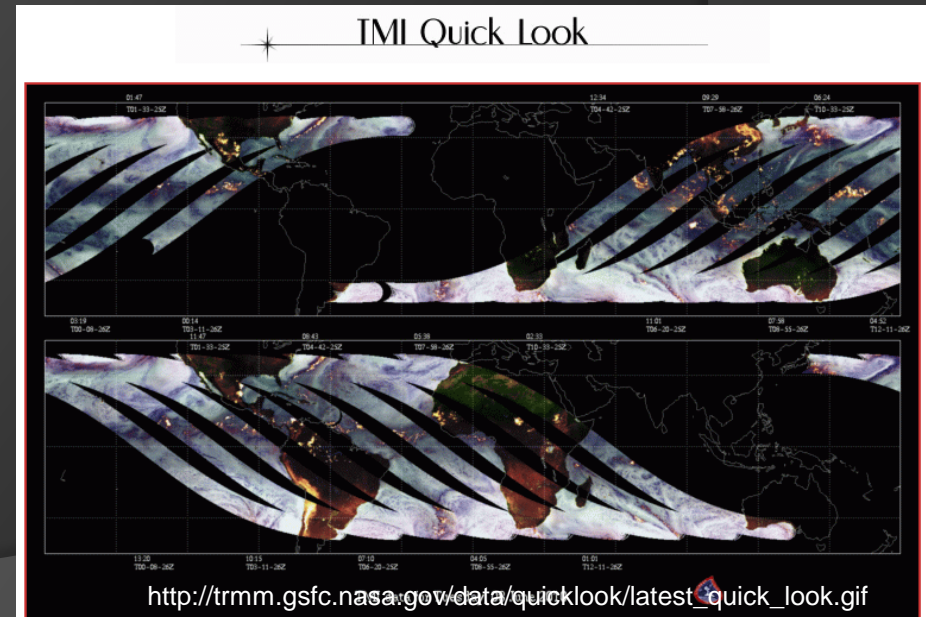
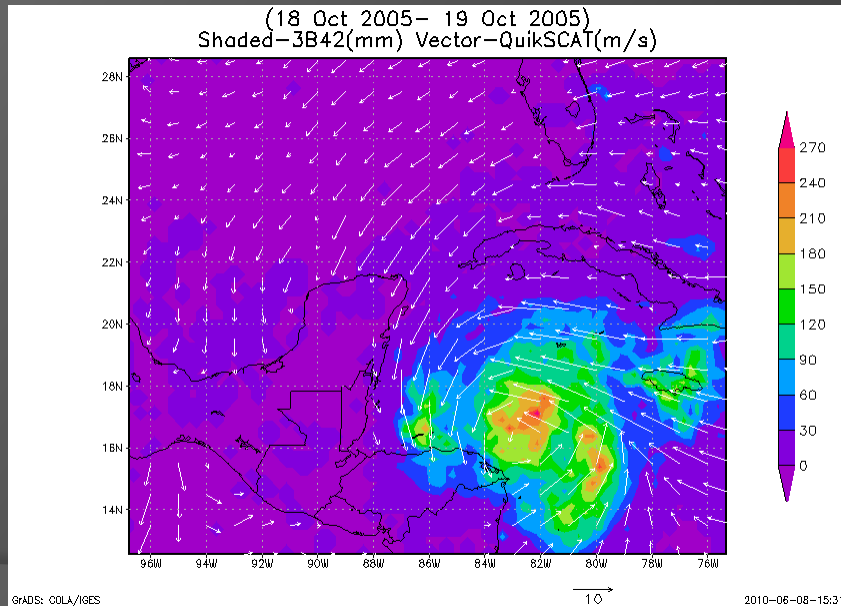


3-hr Realtime Rainfall Analyses



TRMM TOOLS FOR HYDROLOGY ANALYSIS

Amanda DePasquale
GSFC Summer Intern

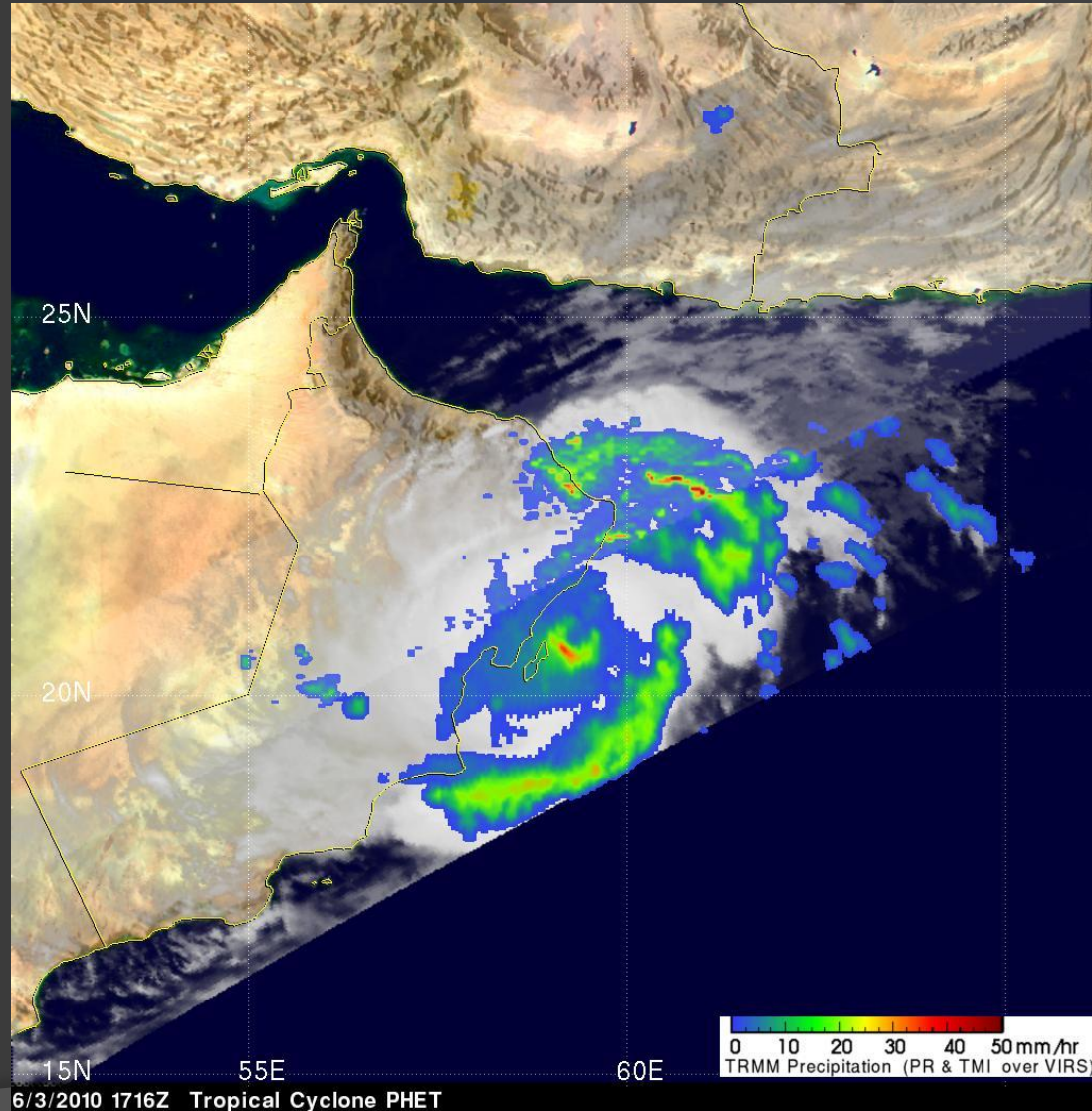


Outline






- Background on TRMM
- Applications
- Tools that can be used to look at the data
- Case study

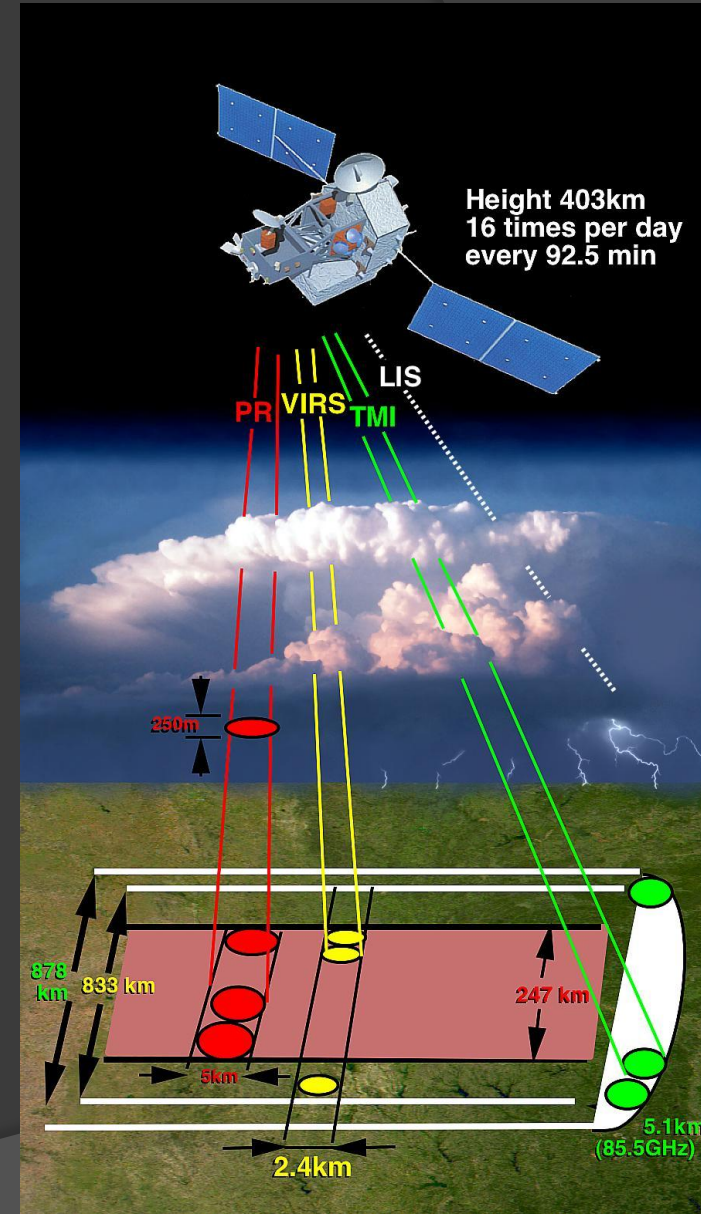
Background on TRMM

- ☁ Tropical Rainfall Measuring Mission
- ☁ Joint mission between NASA & JAXA
- ☁ Designed to monitor and study tropical rainfall



TRMM Instruments

-  **Precipitation Radar (PR):** provides 3-D maps of storm structure, including intensity, rain distribution, storm depth, and height where snow melts to become rain
-  **Visible and InfraRed Scanner (VIRS):** senses outgoing radiation from earth from visible to infrared wavelengths, detecting rainfall
-  **TRMM Microwave Imager (TMI):** passive sensor that measures microwave energy emitted by earth to quantify water vapor, cloud water, and rainfall intensity in the atmosphere
-  **Lightning Imaging Sensor (LIS):** detects and locates lightning
-  **Clouds and the Earth's Radiant Energy System (CERES):** measures energy at the top of the atmosphere and estimates energy in the atmosphere; also determines cloud-amount, altitude, thickness, and size of cloud particles



TRMM Mission

- ☁ Collects data between 35°S and 35°N , and adds composite data from TRMM and other satellite and meteorological data to extend the range from 50°S to 50°N
- ☁ Travels 403 km over the atmosphere, making 16 orbits a day every 92.5 minutes
- ☁ Provides 4-D (3-D plus time) distribution of rainfall and latent heating
- ☁ First satellite mission to establish global distribution of rainfall on earth's surface

Applications of TRMM

- ☁️ Rainfall measurements, especially over oceans and the Southern Hemisphere
- ☁️ Analysis and tracking of hurricanes and typhoons
- ☁️ Global flood and landslide monitoring
- ☁️ Fire potential monitoring
- ☁️ Analysis of rainfall averages, anomalies, and climatology, including the ENSO cycle
- ☁️ Gain valuable hydrological data about developing countries
- ☁️ SST, surface wind speed, atmospheric water vapor, cloud liquid water, and rain rate analysis over oceans

Tools to look at TRMM data

- ☁️ TRMM NASA
- ☁️ TRMM JAXA
- ☁️ Giovanni
- ☁️ Hurricane Analysis Tool
- ☁️ SERVIR
- ☁️ NASA Earth Observations (NEO)
- ☁️ Global Precipitation Analysis (GPCP)
- ☁️ Remote Sensing Systems (RSS)
- ☁️ TRMM – University of Utah

Best Tools for Accessing General Archive Data:

- ◉ Giovanni
- ◉ Hurricane Analysis Tool

Best Tools for Accessing Recent & Near Real-Time Data:

- ◉ TRMM NASA
- ◉ TRMM JAXA
- ◉ Giovanni
- ◉ SERVIR
- ◉ NEO
- ◉ GPCP
- ◉ RSS

Best Tools for Accessing Pre-mapped/Pre-compiled Data:

- ◉ TRMM NASA
- ◉ TRMM JAXA
- ◉ NEO
- ◉ GPCP
- ◉ TRMM U of Utah

TRMM - NASA

TOP STORY

FIRST TROPICAL STORM OF THE 2010 EAST PACIFIC HURRICANE SEASON BRINGS HEAVY RAINS TO CENTRAL AMERICA

The 2010 East Pacific hurricane season began pretty much on schedule. While the season officially begins on May 15 and runs through November 30, in an average year, the first named storm of the season forms around June 10th; this year the first storm of the season, [Tropical Storm Agatha](#), formed on May 29th off the coast of Guatemala from a broad area of low pressure within the Intertropical Convergence Zone (or ITCZ), a band of low pressure that circumnavigates the globe near the Equator where the trade winds converge. Although Agatha's maximum sustained winds were never estimated to be greater than 75 kph (45 mph) by the National Hurricane Center, it still turned out to be a very deadly storm as a result of flash floods and landslides brought about by Agatha's heavy rains.

RESOURCES

- Realtime 3 Hourly & 7 Day Rainfall
- Global Flood & Landslide Monitoring
- Hurricanes & Typhoons
- Rain Averages & Anomalies + ESPI
- TRMM based Climatology
- "QUICKLOOKS" at TRMM Orbits
- Educational Resources

The Tropical Rainfall Measuring Mission satellite (known as TRMM) was placed into service in November of 1997. Armed with an array of active radar and passive microwave sensors, TRMM's main objective is to measure rainfall from space. For increased coverage, TRMM can be used to calibrate rainfall estimates from other additional satellites. The TRMM-based, near-real time Multi-satellite Precipitation Analysis (TMPA) at the NASA Goddard Space Flight Center is used to monitor rainfall over the global Tropics. TMPA rainfall estimates for the 1-week period 25 May to 1 June 2010 for Central America show that the heaviest rains fell just off shore and right along the Pacific coast side of Guatemala, El Salvador, Honduras and northwestern Nicaragua. Over 500 mm (~20 inches, shown in red) fell in two areas off the coasts of Guatemala and El Salvador. Over land, between 250 mm (~10 inches, shown in bright green) and 350 mm (~14 inches, shown in darker orange) of rain fell over the coastal areas of Guatemala and between 150 mm (~6 inches, shown in bright blue) and 250 mm fell over the coastal sections of El Salvador, Honduras and Nicaragua. [CLICK HERE TO READ MORE](#)

TRMM is a joint mission between NASA and the Japanese space agency JAXA.

Image by Hal Pierce (SSAI/NASA GSFC) and Caption by Steve Lang (SSAI/NASA GSFC)

3 June 2010

- <http://trmm.gsfc.nasa.gov>
- The TRMM website describes the TRMM mission, instruments, news, publications, and data collected
- The homepage includes Top Stories of events that TRMM has been used to analyze
- The resources on the right of the page give the user access to a multitude of information (these links will be explored further on the subsequent slides):
 - Real time 3 hourly and 7 day rainfall
 - Global flood and landslide monitoring
 - Hurricanes and typhoons
 - Rain averages and anomalies + ESPI
 - Climatology
 - QuickLooks at orbits
 - Educational resources

TRMM - NASA

- At the bottom of the homepage, there is a link to download Google Earth imagery from TRMM that is updated daily
- Clicking on the +DATA tab at the top of the homepage brings the user to a set of links to Data Products from TRMM
 - These links provide data downloads and links to other useful pages that use TRMM data

Google Earth Downloads Updated:
11 JUN 2010 1500 UTC

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | PUBLICATIONS | SEARCH TRMM | CONTACTS | **+DATA** | +IMAGE POLICY

Data Products

Quick Looks - On-Line TMI Quick Look images TMI quick-looks available on-line. Each quick-look is generated at a resolution of 1/4 degree, thus generating an image of 1440x720 pixels, or a file size of about 500k.

PPS - Precipitation Processing System (PPS) also formerly known as TRMM Science Data and Information System The real-time processing and post-processing of the TRMM science data is performed by the TRMM Science Data and Information System (TSDES). Working with the TRMM principal investigators and science algorithm developers, PPS maintains the operational science data processing system and ensures the timely processing of all TRMM science instrument data. During routine operations, raw instrument data is received in near real-time by PPS and then processed by the first tier of science algorithms to produce calibrated, swath-level instrument data. Using this calibrated, swath-level instrument data, the second tier of algorithms are used to compute geophysical parameters, such as precipitation rate, also at the swath-level resolution. At the final stage of processing, the third tier algorithms produce gridded geophysical parameters from the first- and second-tier instrument data. All TRMM products are archived and distributed by the Goddard Distributed Active Archive Center (GES DISC DAAC). For further information concerning PPS operations go to the PPS homepage.

GES DISC DAAC - Distributed Active Archive System The operational archiving and distribution to the public of all TRMM science data products is provided by the [Goddard Distributed Active Archive Center \(GES DISC DAAC\)](#). In addition to archiving and distributing the TRMM science data, the GES DISC DAAC also provides necessary information and support for manipulating these data files, which are provided in NCSA's Hierarchical Data Format (HDF). These files are generally distributed on-line. Finally, the GES DISC DAAC provides first-line support for any questions concerning the TRMM science data. To obtain TRMM science data, go to the Goddard GES DISC DAAC homepage.

Data Products & Description - In order to satisfy opposing requirements for early data distribution and the highest possible data quality, TRMM will reprocess all products with improved algorithms approximately once per year. This section, aside from presenting general product information, updates the performance of each algorithm as information becomes available to the science team. Data users should check this site before working with any TRMM data, and occasionally thereafter as more information becomes available. All information is tied to the data version number as distributed by the GES DISC DAAC.

TRMM GROUND VALIDATION - The function of the TRMM GV program at the NASA/Goddard Space Flight Center is to provide support for Tropical Rainfall Measuring Mission (TRMM), in connection with the ground based validation of the TRMM satellite observations. The TRMM Satellite Validation is the focal point for the planning and implementation of a broad and integrated observational program of precipitation and related climate research, designed to meet the specific science validation objectives established by the TRMM science team, and which are also consistent with programs established by NASA Headquarters.

TRMM-based precipitation estimates - A series of quasi-global, near-real-time, TRMM-based precipitation estimates is available to the research community via anonymous [ftp](#). The estimates are provided on a global 0.25° x 0.25° grid over the latitude band 50° N-5° S within about seven hours of observation time. Three products are being provided: A TRMM-calibrated merger of all available TMI, AMSR-E, SSM/I, and AMSU-B precipitation estimates (three-hourly accumulations); a geosynchronous infrared estimate which is calibrated by the merged-microwave data (hourly estimates); and a combination of the first two fields (three-hourly accumulations). The data are available under [ftp://trmmopen.gsfc.nasa.gov/pub/merged/](#). Users are urged to download the README first for additional details.

See links to other web sites related to TRMM

Google Earth Downloads Updated:
11 JUN 2010 1500 UTC

- The Google Earth link brings the user to a new page
- Updated daily, this page includes 3 sections of global Google Earth data
 - Top section: links to realtime 30 day rainfall average and 30 day rainfall anomaly (mm/hr) globally
 - Middle section: links to realtime rainfall accumulation for 3 hr, 24 hr, 72 hr, and 168 hr data
 - Bottom section: links to realtime flood potential for 24 hr, 72 hr, and 168 hr time periods

TRMM Tropical Rainfall Measuring Mission

ABOUT TRMM | NEWS | WEB POLICY | PUBLICATIONS | SEARCH TRMM | DATA

LAST UPDATED: **11 JUN 2010 1500 UTC**

REALTIME 30 Day Average Rainfall and 30 Day Anomalous Rainfall

Select from the following list to download files which show REALTIME 30 Day Average Rainfall and 30 Day Anomalous Rainfall images like those above in GOOGLE EARTH.

1. you must have Google Earth installed and running in order to load and use these KML files.
2. You may wish to download the latest version of GOOGLE EARTH from <http://earth.google.com/>.

http://trmm.gsfc.nasa.gov/trmm_rain/Events/30_day_average.kml

http://trmm.gsfc.nasa.gov/trmm_rain/Events/30_day_anomaly.kml

REALTIME RAINFALL ACCUMULATION

Select from the following list to download files which show REALTIME RAINFALL ACCUMULATION (FROM 3042) images in GOOGLE EARTH.

1. you must have Google Earth installed and running in order to load and use these KML files.
2. You may wish to download the latest version of GOOGLE EARTH from <http://earth.google.com/>.

http://trmm.gsfc.nasa.gov/trmm_rain/Events/3042_rain_accumulation_3hr.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3042_rain_accumulation_24hr_b.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3042_rain_accumulation_72hr_b.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/3042_rain_accumulation_168hr_b.kml

REALTIME FLOOD POTENTIAL

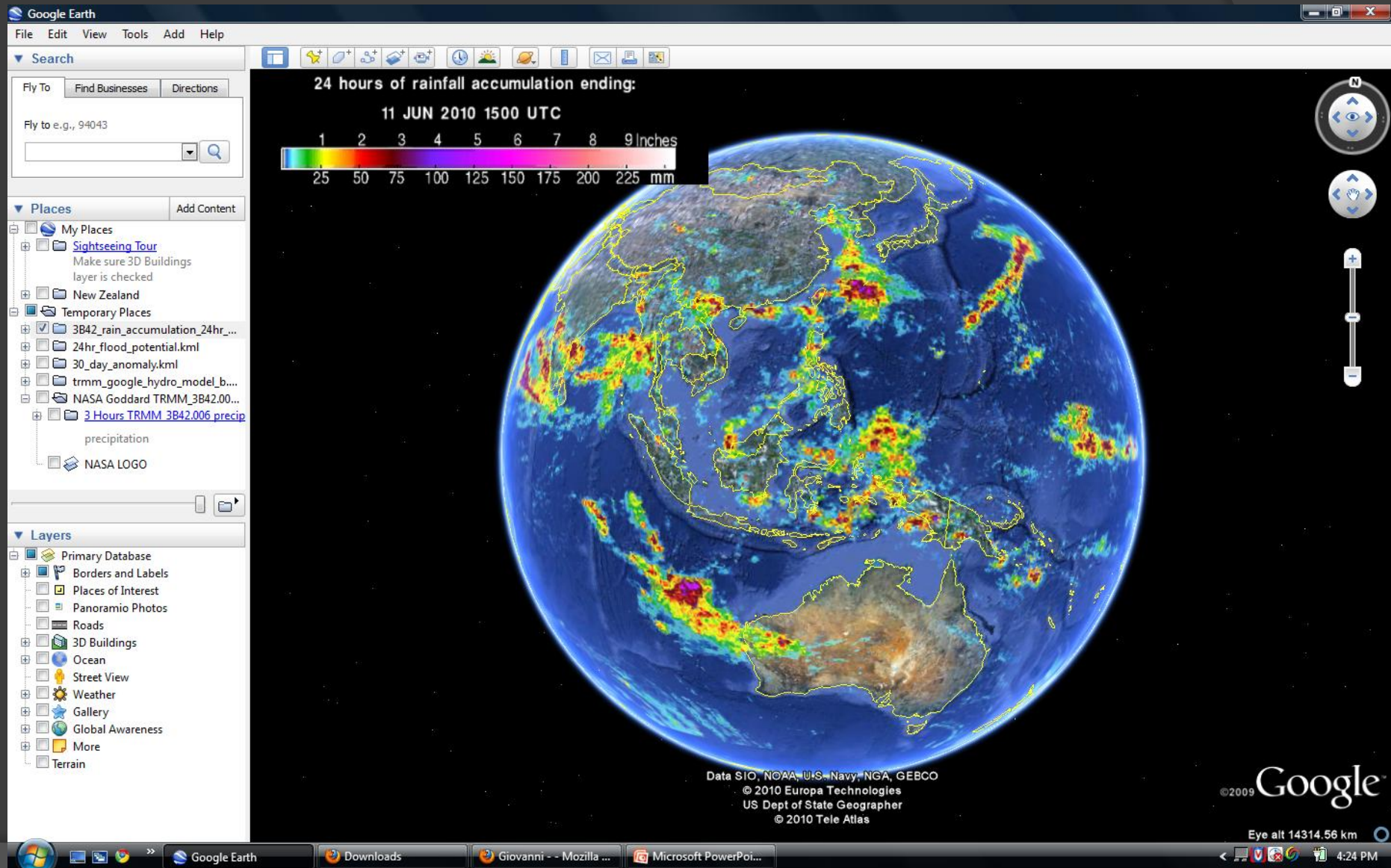
Select from the following list to download files which show REALTIME FLOOD POTENTIAL images in GOOGLE EARTH. (Note: you must have Google Earth installed in order to be able to load these KML files.)

http://trmm.gsfc.nasa.gov/trmm_rain/Events/24hr_flood_potential.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/72hr_flood_potential.kml
http://trmm.gsfc.nasa.gov/trmm_rain/Events/168hr_flood_potential.kml

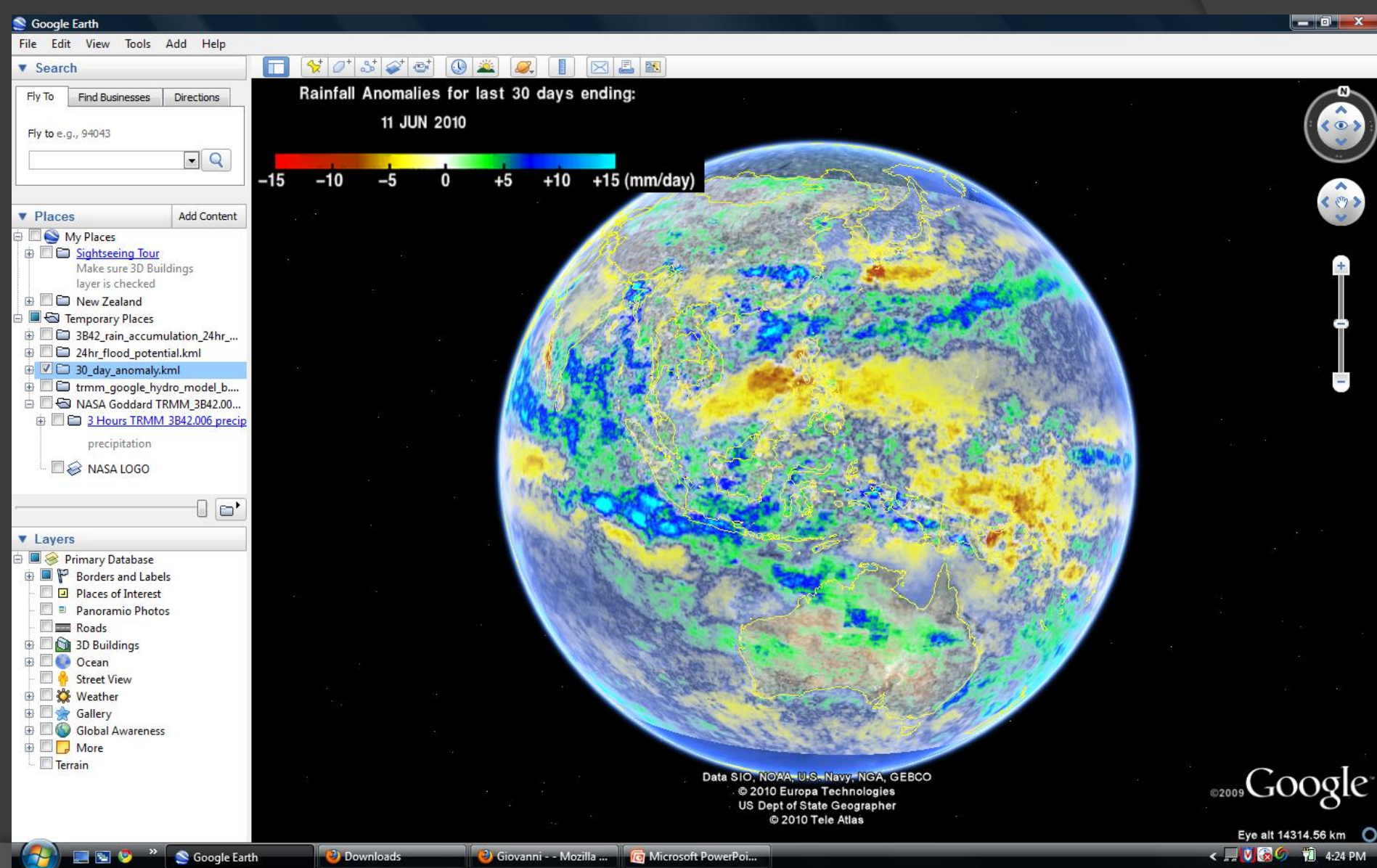
LET ME KNOW ABOUT PROBLEMS OR GIVE SUGGESTIONS -> piace@trmm.gsfc.nasa.gov

http://trmm.gsfc.nasa.gov/affinity/download_kmz.html

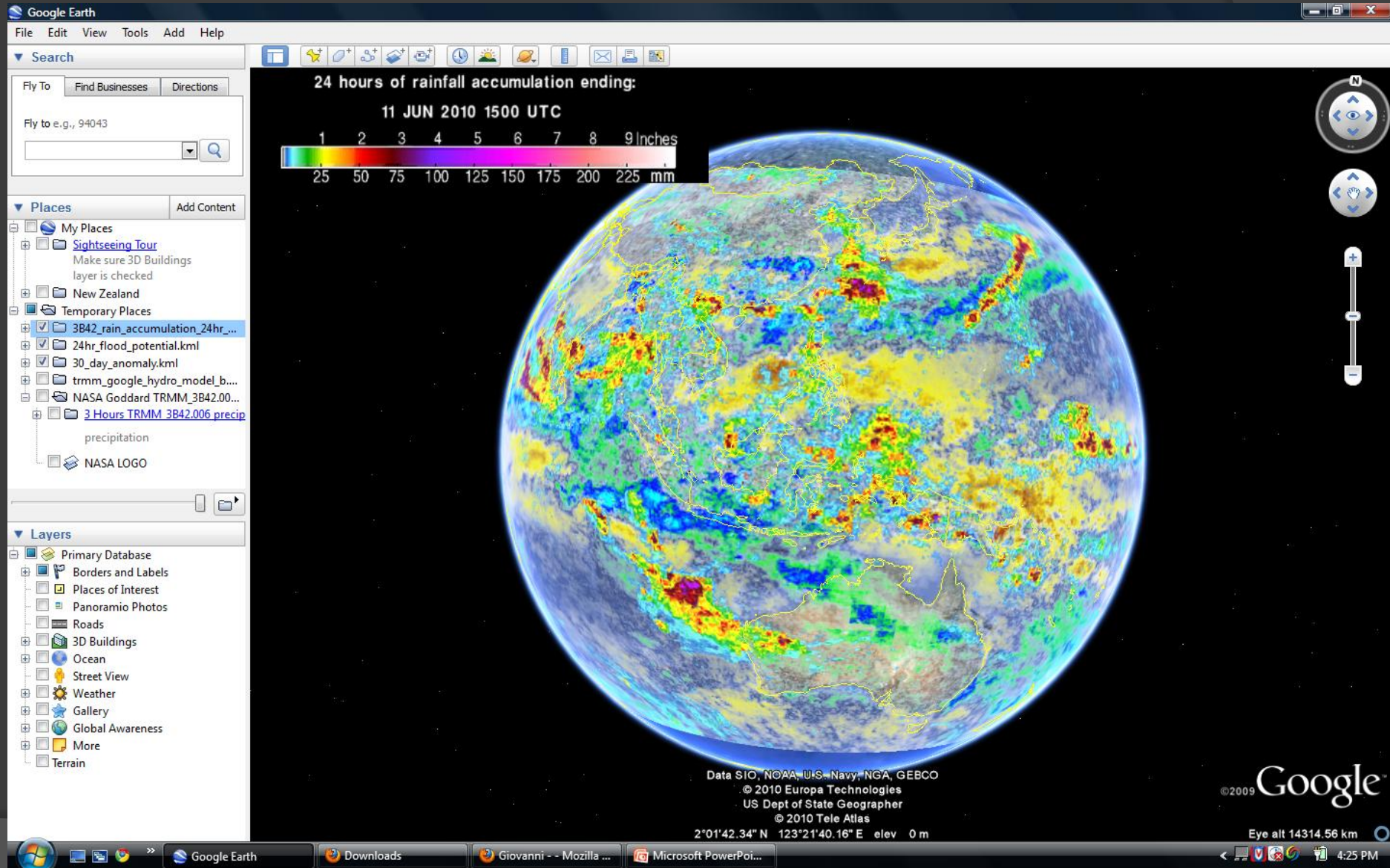
Realtime Rainfall Accumulation Image in Google Earth



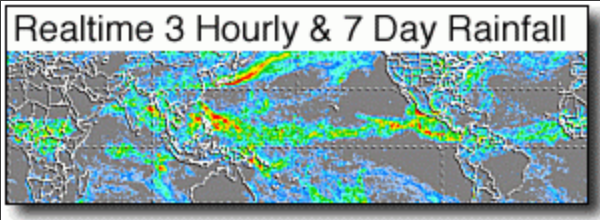
Rainfall Anomaly Image in Google Earth



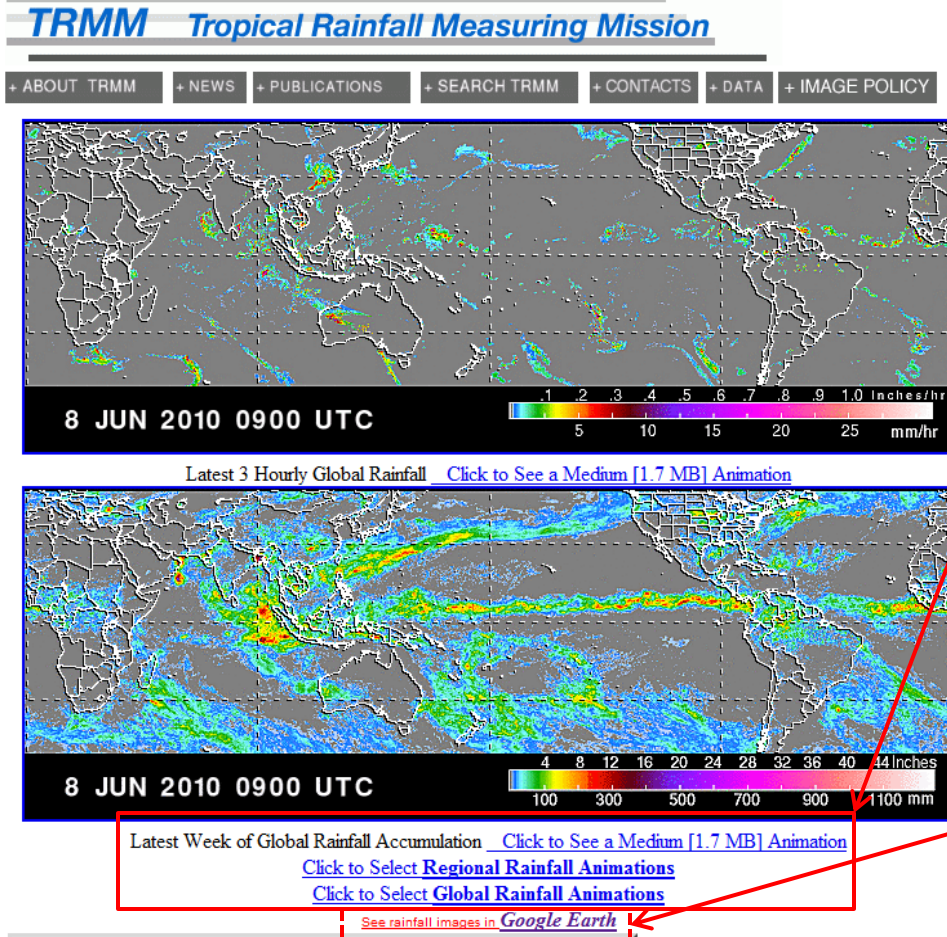
Realtime Rainfall Accumulation, 24 hr Flood Potential, 30 Day Anomaly Images Layered in Google Earth



TRMM – NASA: Resources




- Realtime 3 Hourly & 7 Day Rainfall brings the user to a site with two Realtime maps
- At the bottom of the page, there are links for a weekly animation, and regional and global rainfall animations
- There is also a link to view the data in Google Earth (takes the user to the same page as the Google Earth link on the homepage)



TRMM – NASA: Resources

- Global Flood & Landslide Monitoring is a very useful site for observing maps of heavy rain, flood, and landslide estimates globally
- Clicking on any of the maps brings the user to more in depth analysis by region
- The user can also download the data into Google Earth

Global Flood & Landslide Monitoring



TRMM Tropical Rainfall Measuring Mission

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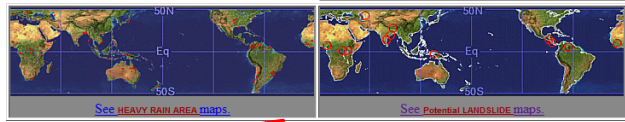
Current Heavy Rain, Flood and Landslide Estimates
(Rain information from Real-Time TRMM Multi-Satellite Precipitation Analysis [TMPA/3B42])

NOTICE: See New GOOGLE EARTH Download (KML) http://trmm.gsfc.nasa.gov/trmm_rain/Events/trmm_google_hydro_model_h.kml

See TEXT REPORT of areas with estimates of severe flooding near weather station locations

8 JUN 2010 0900 UTC
(Observation Time of Last Data Processed)

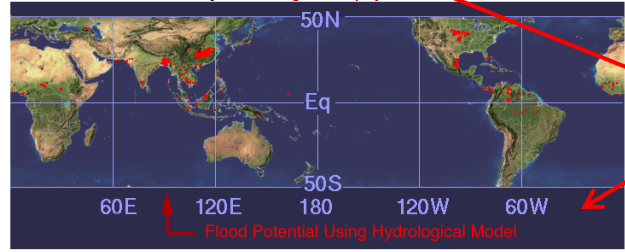
Point & Click 24 HR Rain Values | Point & Click 72 HR Rain Values | Point & Click 168 HR Rain Values



[See HEAVY RAIN AREA maps](#) | [See Potential LANDSLIDE maps](#)

[\(CLICK TO SEE\) TROPICAL CYCLONE HARGIS QUICKTIME ANIMATION \(14.3 MB\)](#)
[\(CLICK TO SEE\) TROPICAL CYCLONE HARGIS MP4 ANIMATION \(3.8 MB\)](#)

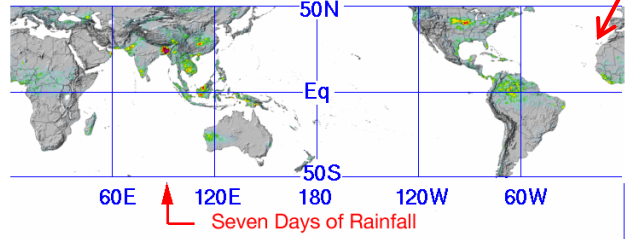
Click on the maps below for **regional displays** with more information



Flood Potential Using Hydrological Model

A Relevant publication (pdf) for the hydrological model shown above is: Hong, Y., R. F. Adler, F. Hossain, S. Curtis, and G. J. Huffman (2007), *A First Approach to Global Runoff Simulation using Satellite Rainfall Estimation*, Water Resources Research, Vol. 43, No. 8, W08502, doi: 10.1029/2006WR005729

[Click to see a FULL GLOBE HYDROLOGICAL MODEL FLOOD POTENTIAL IMAGE](#) | [Click to see a SMALLER FULL GLOBE HYDROLOGICAL MODEL FLOOD POTENTIAL IMAGE](#)



Seven Days of Rainfall

GOOGLE EARTH DOWNLOADS

CLICK on the KML file below to download a file which show a **REAL-TIME FLOOD POTENTIAL** image using **GOOGLE EARTH**.

Updated October 31, 2008 (Note: you must have Google Earth installed in order to be able to load these KML files.)
http://trmm.gsfc.nasa.gov/trmm_rain/Events/trmm_google_hydro_model_h.kml

Flood Potential Image in Google Earth



TRMM – NASA: Resources

- Hurricanes & Typhoons is an analysis of tropical cyclones globally
- The first section explains the two types of analysis maps that are included on the page, using historical examples
- By clicking on an ocean basin on the map, the user is connected to a page with links to historical tropical cyclone precipitation maps and time series maps separated by year and name of storm from 1998 to 2006
- The next section includes a description of how TRMM data can be used to look at tropical cyclone rain and precipitation radar as vertical cross section slices
- Links at the bottom include this year's storms, this year's animations, and previous precipitation radar animations

Hurricanes & Typhoons

TRMM Tropical Rainfall Measuring Mission

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The images on the right are examples of hurricane and typhoon (tropical cyclone) rainfall analyses. The first example is a plan view showing the distribution of rainfall accumulation near a tropical cyclone. The second panel example shows the time-radius distribution and the time-azimuthal distribution of rainfall near the same tropical cyclone. These analyses use the [3B42 global rainfall estimates](#). The technical point of contact for information about the images on the right is [Dr Scott Braun](#). You can see many other plots for storms in the Atlantic, Pacific, and Northern Indian Ocean by clicking on the relevant area on the map below.

Click Ocean Basins On The Map Below To See Tropical Cyclone Rainfall Plots

Western Pacific | Eastern Pacific | Atlantic Ocean | Indian Ocean | South Pacific

The image below is the result of automatic processes designed to show the latest hurricanes and typhoons (tropical cyclones) observed by the TRMM satellite. The images are made and stored in near "realtime". TRMM [VIRS](#), [TMI](#) and [PR](#) are processed for use in these displays. The "A" to "B" line on the static image on the left below is drawn where the highest value of radar reflectivity was found. Animations show multiple vertical cross sections (slices) of Precipitation Radar reflectivity.

TRMM Precipitation Radar

15N 60E 65E 6/2/2010 0140Z PHET Arabian Sea

Light Rain Moderate Rain Heavy Rain

15 20 25 30 35 40 45 50 55 dBZ

Latest Tropical Cyclone from TRMM Precipitation Radar

click to [SEE ALL 2010 STORMS](#) | click to see [LATEST ATLANTIC STORMS](#) | [VERY LARGE \[8.0 mb\]](#) Quicktime animation | [LARGE \[4.0 mb\]](#) Quicktime animation

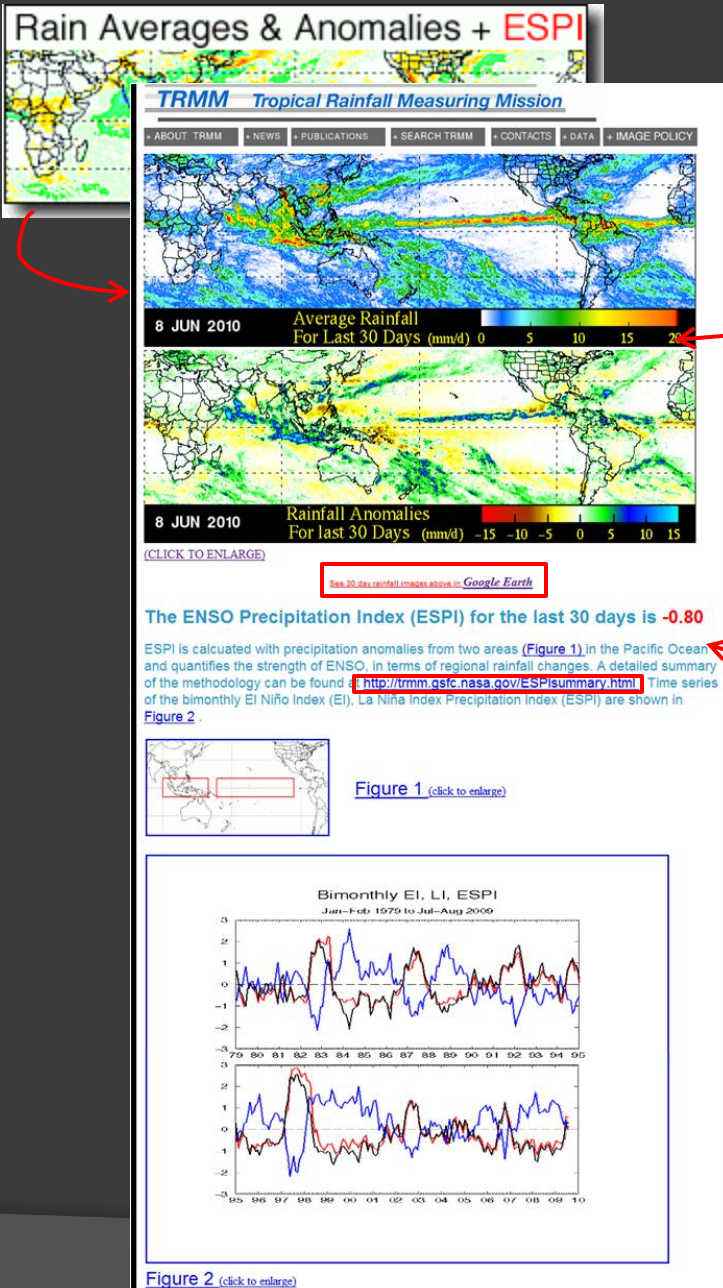
[click to see 2009 Precipitation Radar vertical slice animations](#)

[click to see 2008 Precipitation Radar vertical slice animations](#)

[click to see 2007 Precipitation Radar vertical slice animations](#)

[click to see 2006 Precipitation Radar vertical slice animations](#)

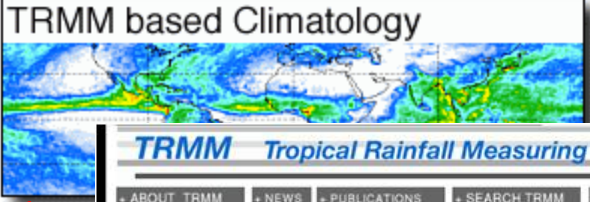
TRMM – NASA: Resources



- Rain Averages & Anomalies + ESPI is excellent for looking at monthly trends in rainfall and examining the ENSO cycle
- The first section displays maps of average rainfall and rainfall anomalies for the last 30 days
 - This includes a link to view the maps in Google Earth (takes the user to the same page as the Google Earth link on the homepage)
- The next section deals with ENSO and analyzing the current and past conditions using the ENSO Precipitation Index (ESPI)
 - ESPI is a precipitation based measure of ENSO using precipitation anomalies across the equatorial Pacific
 - For a summary of the indices in ESPI, click the link, or visit:
<http://trmm.gsfc.nasa.gov/ESPIsummary.html>

TRMM – NASA: Resources

TRMM based Climatology



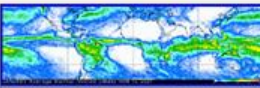
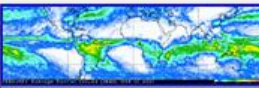
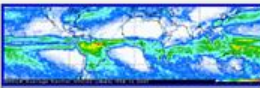
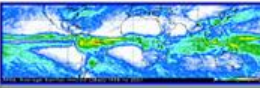
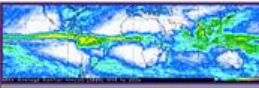
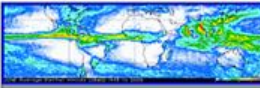
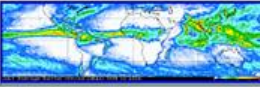
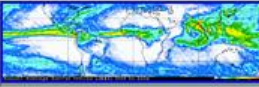
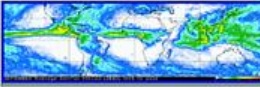
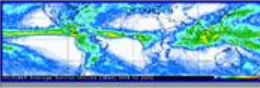
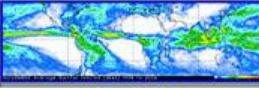
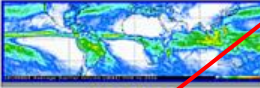
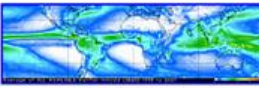
TRMM Tropical Rainfall Measuring Mission

+ ABOUT TRMM + NEWS + PUBLICATIONS + SEARCH TRMM + CONTACTS + DATA + IMAGE POLICY

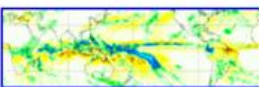
RAINFALL CLIMATOLOGY FROM 3B43

The images below are the result of averaging all available Monthly 0.25 ° x 0.25 ° 3B43 merged TRMM and other sources estimates data. The images cover the globe from 40 ° North to 40 ° South. For more information see [3B43.html](#).

Click on the tables or images below to see full resolution images.

 JANUARY	 FEBRUARY	 MARCH
 APRIL	 MAY	 JUNE
 JULY	 AUGUST	 SEPTEMBER
 OCTOBER	 NOVEMBER	 DECEMBER
 ALL MONTHS		

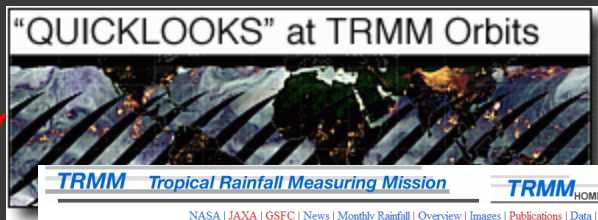
[Click here to see a Quicktime animation \(3MB\) of 12 monthly mean images.](#)
[Click here to see a Mpeg animation \(.35MB\) of 12 monthly mean images.](#)



[SEE RAINFALL ANOMALIES FOR ALL MONTHS \(1998-2009\)](#)

- TRMM based Climatology is the average monthly global rainfall based on 3B43 merged TRMM and other data from 1998 to 2009
 - Climatology is defined as average weather conditions over a period of time, and is used to develop relationships, build models, make forecasts, and find patterns in the weather over time
- By clicking on the months, the user can view the full resolution images
- The user can also access the yearly averaged total rainfall map from 1998 to 2008 and animations of the images
- Finally, the user can view monthly global rainfall anomalies by clicking the last link
 - This opens a new page with maps of rainfall anomalies from 1998 to 2010

TRMM – NASA: Resources

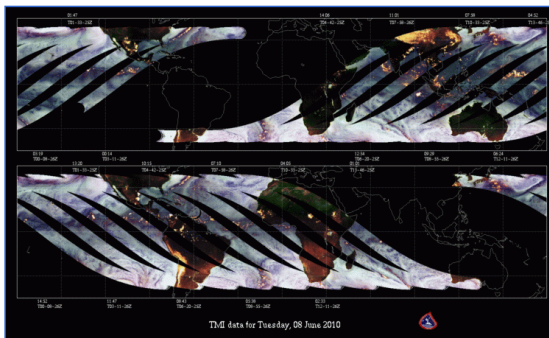


TRMM Tropical Rainfall Measuring Mission

TRMM HOME

[NASA](#) | [JAXA](#) | [GSFC](#) | [News](#) | [Monthly Rainfall](#) | [Overview](#) | [Images](#) | [Publications](#) | [Data](#) | [Education](#) | [Validation](#) | [Links](#) | [Contacts](#) | [Privacy Statement](#) | [Image Policy](#)

IMI Quick Look



[Click for high resolution version](#)

Quick Look images are made from TRMM Microwave Imager (TMI) data. Microwave brightness temperatures at 85.5 GHz and at 37.0 GHz are combined in the red, green and blue components (guns) of the images. For more information see "Negi, Andrew J., Robert F. Adler, Christian D. Kummerow, 1989: False-Color Display of Special Sensor Microwave/Imager (SSM/I) Data. Bulletin of the American Meteorological Society, Vol. 70, No. 2, pp. 140-151."

See the table below for the meaning of colors.

Water surfaces
Dry atmosphere - blue
moist atmosphere - dark blue

Other Surfaces
Polar snow/ice - white/yellow
Sea ice - green/brown

Land surfaces
Snow Cover - white/grey
land (non-desert) - grey/brown
Deserts - light green

Clouds/precipitation
Scattering (by cloud ice) - yellow
Emission (over water) - black

Current and Previous Month

May 2010						
S	M	Tu	W	Th	F	S
-	-	-	-	-	-	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	-	-	-	-	-

June 2010						
S	M	Tu	W	Th	F	S
-	-	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	-	-	-

Past Years

- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010

To obtain TRMM science data,
go to [TRMM Data Search and Order System](#) at the Goddard DAAC.

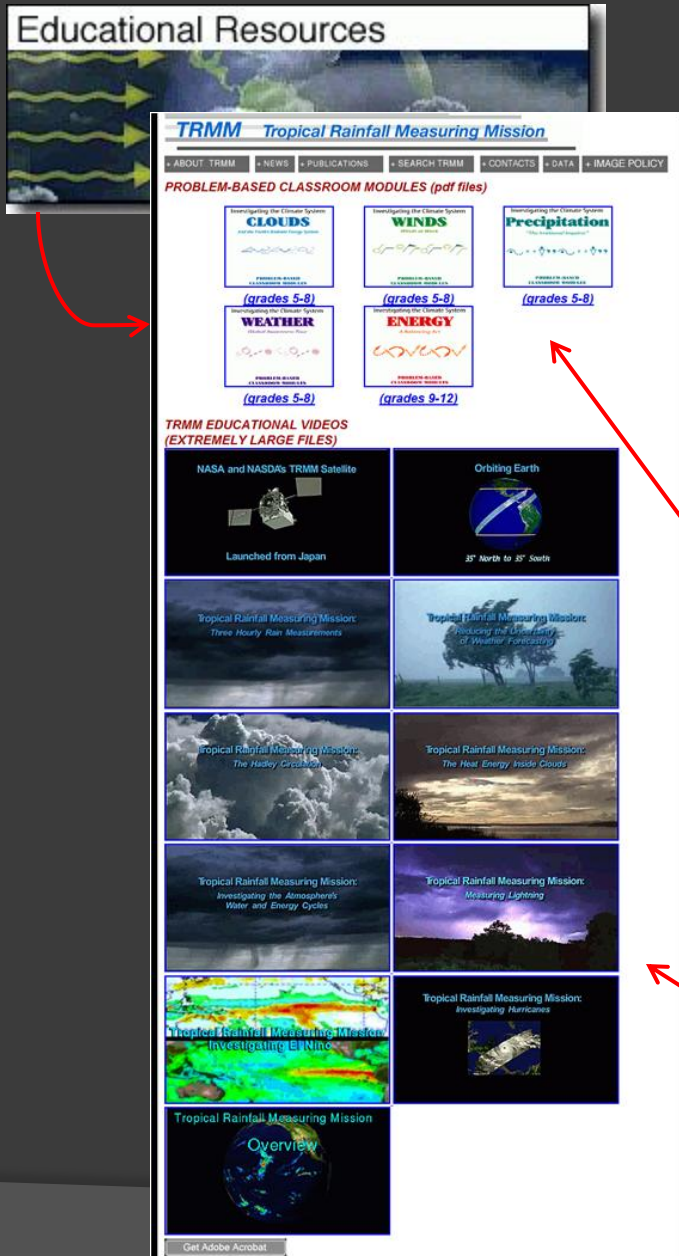
“QUICKLOOKS” is a map of the TMI data collected by TRMM during its orbit

The main map displays the current day's data

The legend explains what each color represents

The user can also view other orbits from the current and previous months, and past years

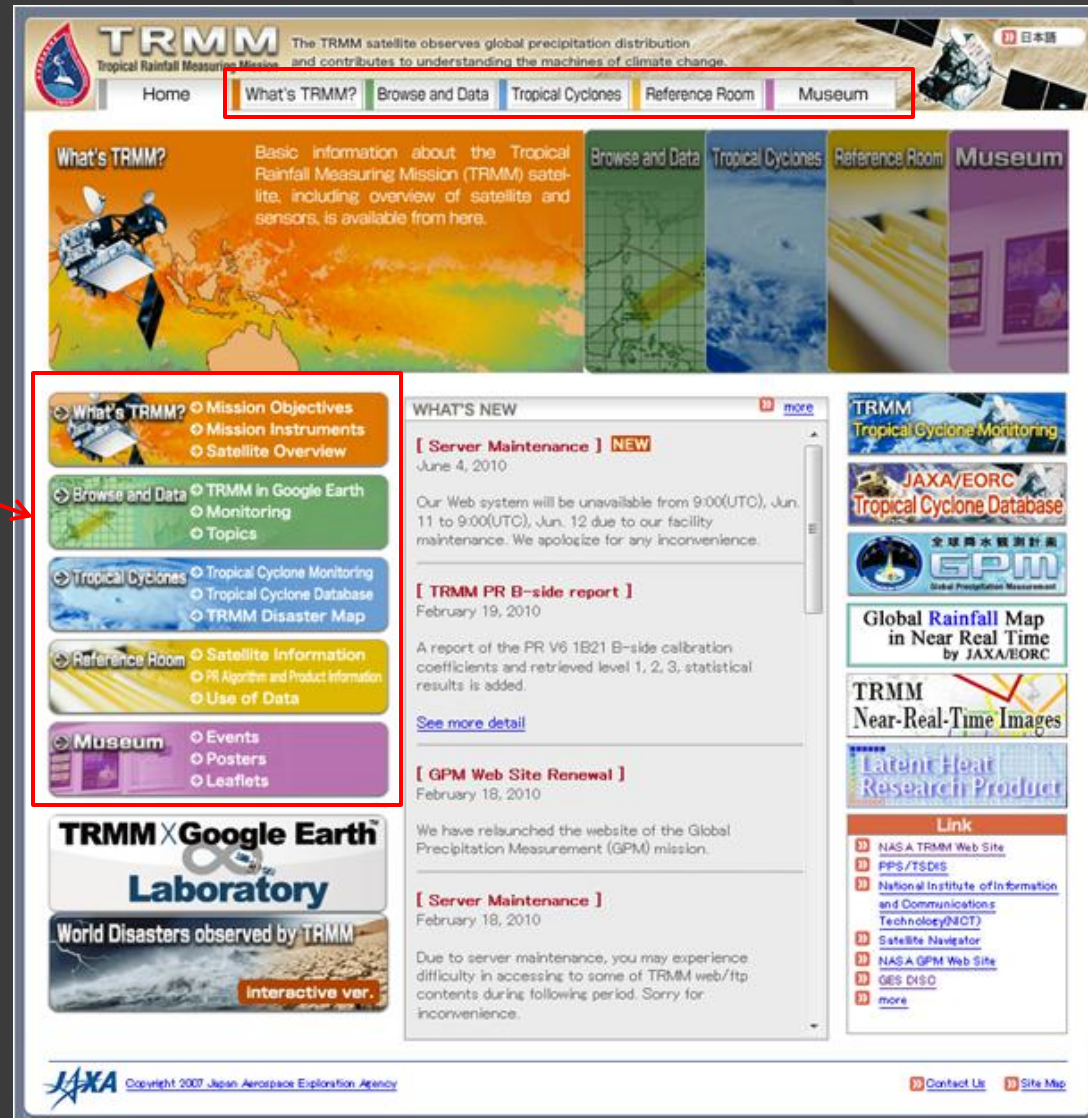
TRMM – NASA: Resources



- Educational Resources features a set of tools used to teach people about the climate system and the TRMM mission
- Problem-based classroom PDF Modules are available for grades 5-8 (clouds, winds, precipitation, weather) and 9-12 (energy)
- A variety of videos examining different aspect of the TRMM mission are also available

TRMM - JAXA

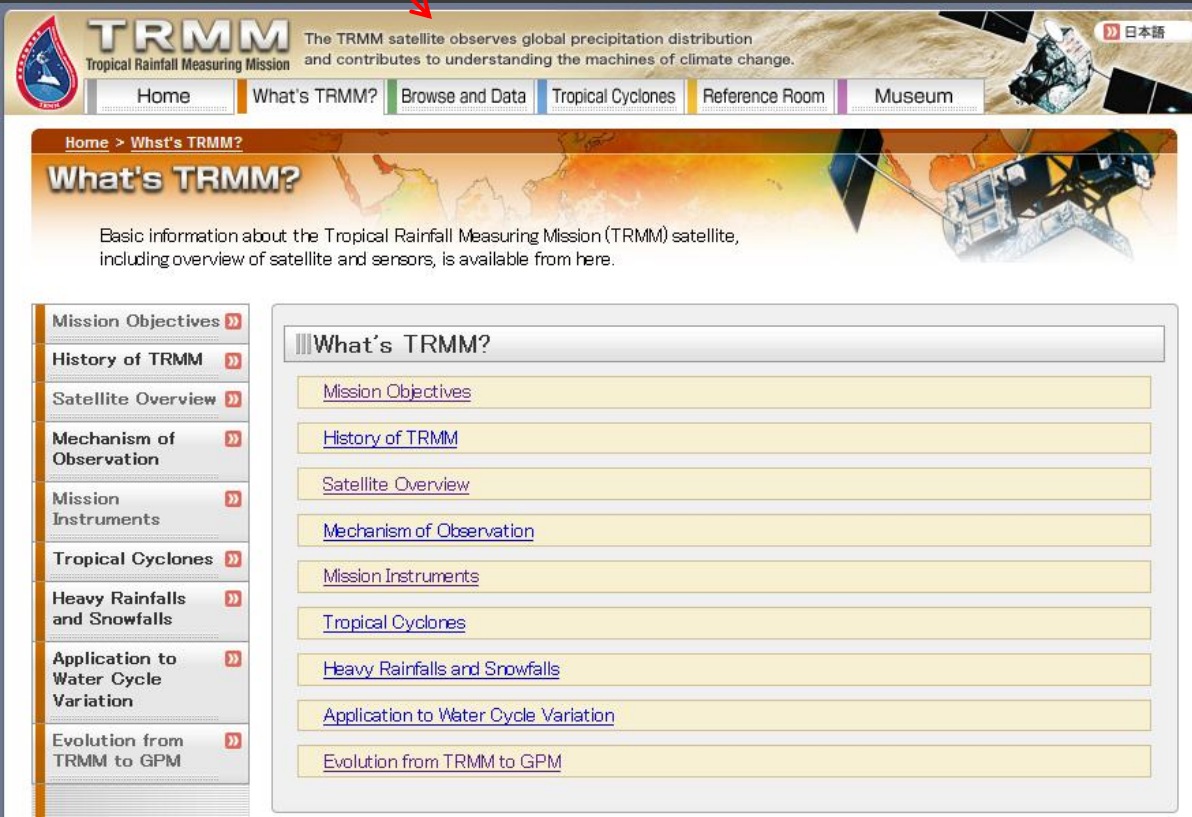
- http://www.eorc.jaxa.jp/TRMM/index_e.htm
- JAXA's website has 5 subsections describing the TRMM mission and data:
 - What's TRMM?
 - Browse and Data
 - Tropical Cyclones
 - Reference Room
 - Museum
- Also links to News, Google Earth Laboratory, World Disasters, Cyclone Monitoring and Database, GPM, Global Rainfall Map and other images in Near-Real-Time, and Latent Heat Research Project



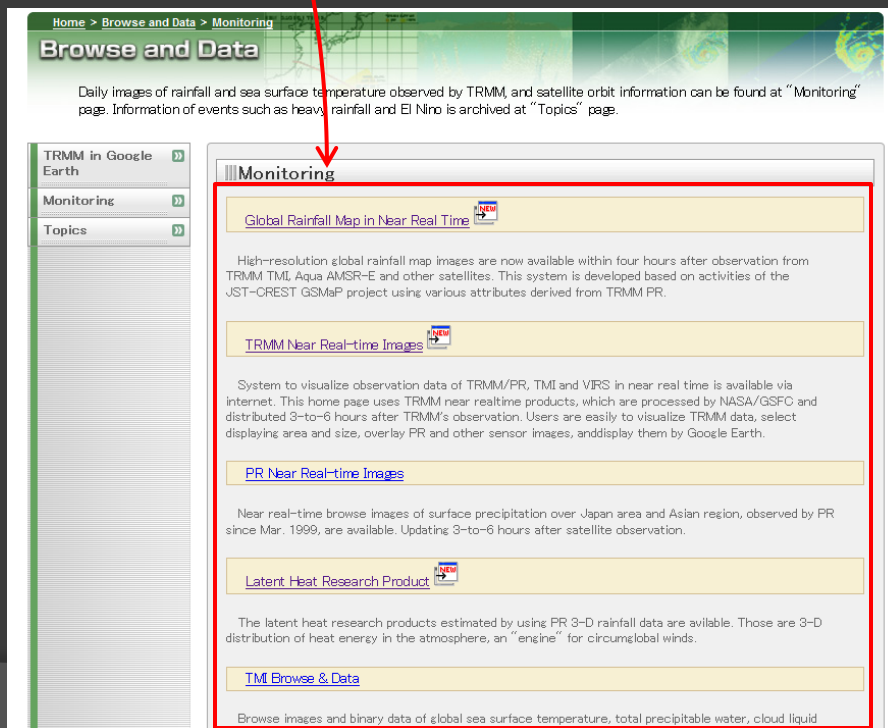
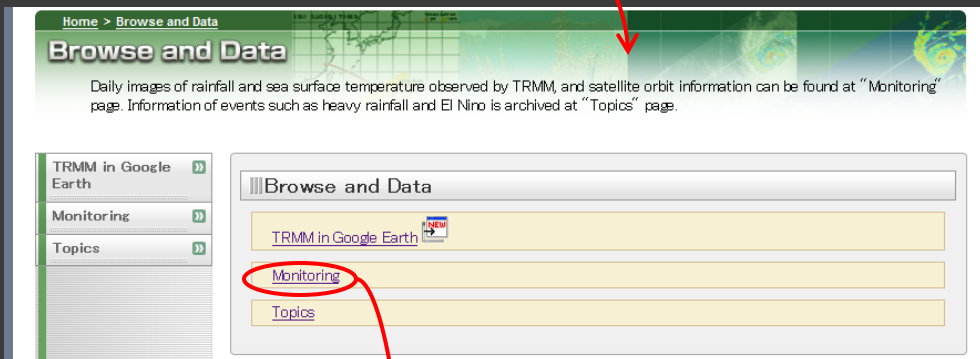
TRMM – JAXA: What's TRMM?



- What's TRMM?
Has valuable information about the TRMM mission and its importance
- With a variety of subsections, the user can learn everything about the satellite and even the future of TRMM



TRMM – JAXA: Browse and Data



- Browse and Data includes subsections for Google Earth, monitoring, and specific topics
- Clicking the Monitoring link brings the user to another page of links of maps based on TRMM data
- Each link allows the user to choose dates and regions for examination

TRMM – JAXA: Browse and Data

Home > Browse and Data > Topics

Browse and Data

Daily images of rainfall and sea surface temperature observed by TRMM, and satellite orbit information can be found at "Monitoring" page. Information of events such as heavy rainfall and El Nino is archived at "Topics" page.

TRMM in Google Earth »

Monitoring »


Topics »

Topics

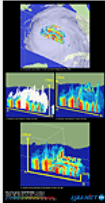
[2005](#) / [2004](#) / [2002](#) / [2001](#)
[2000](#) / [1999](#) / [1998](#) / [1997](#)

2005

[Page Top](#)


 [Hurricane 「KATRINA」 \(August 28, 2005\)](#)

Hurricane 「KATRINA」 (August 28, 2005)

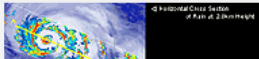


2004

[Page Top](#)

 [Typhoon NAMTHEUN \(13W\)/T0410 \(July 27, 2004\)](#)

Typhoon NAMTHEUN (13W) / T0410 - (July 27, 2004)



- “Topics” is devoted to specific natural events that were analyzed using TRMM data
- Topics are separated by year

TRMM – JAXA: Browse and Data

TRMM X Google Earth™ Lab.



What happens when you combine Google Earth and TRMM?

[Japanese]

Let's enjoy TRMM data by using "GoogleEarth"!

You will see new collaboration between TRMM and GoogleEarth from our laboratory.



Google Earth
Training

Getting the information for using
Google Earth with Earth
Observation Satellite images.



What's
TRMM

Introducing you to TRMM. Where
does it moves? What can be
observed?



Chase the
Typhoon

Viewing the birth and death of
Typhoons on Google Earth.

How to download Google Earth KML files

- 1) Check contents you want from below.
- 2) Click the [Generate KML - Download] button.

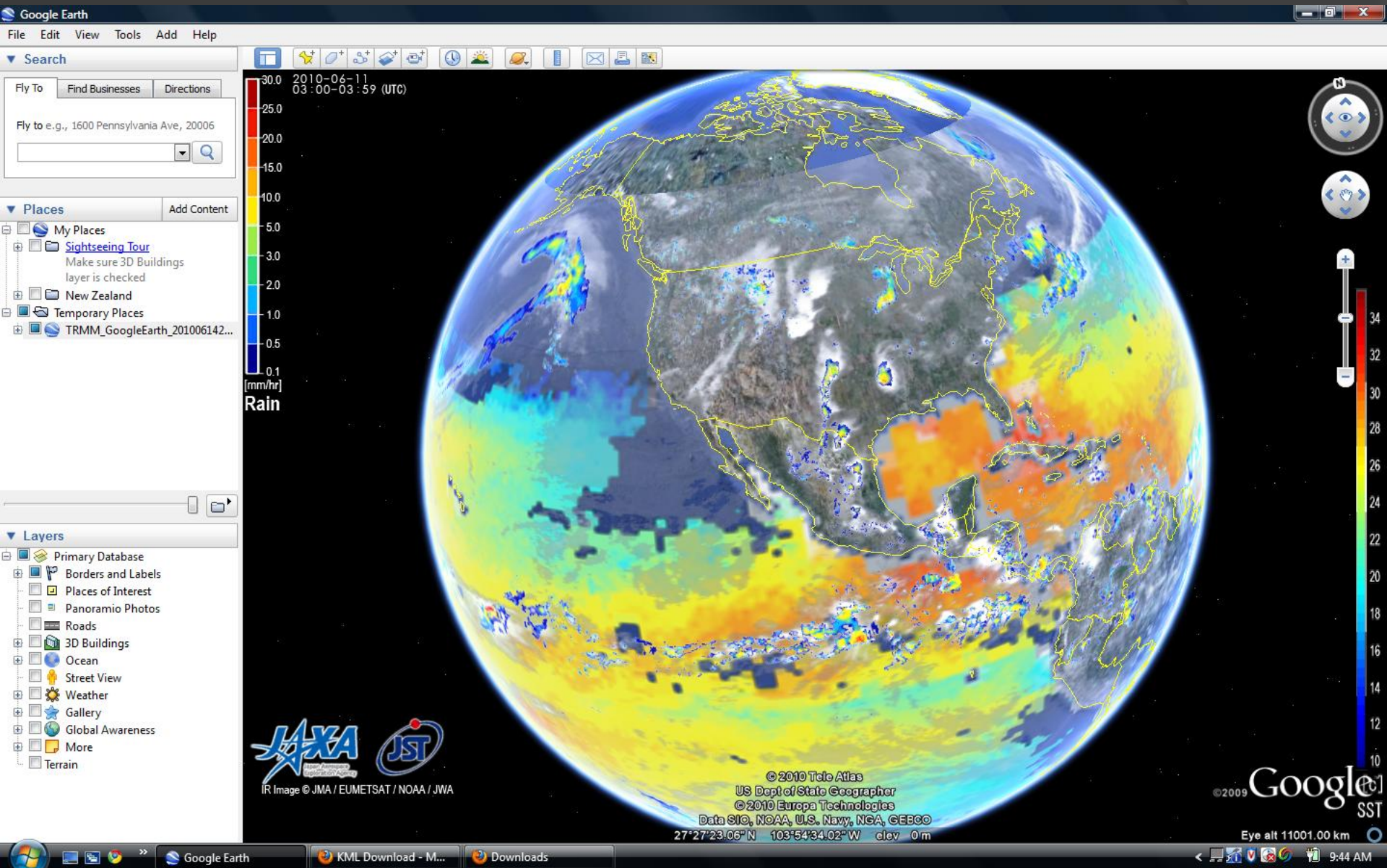
Contents		this content is about:		
		1. Look for T. baby.	2. Forecast Route.	3. Obser- vation
JAXA	<input type="checkbox"/> TRMM real-time monitoring for tropical cyclones http://www.eorc.jaxa.jp/TRMM/NRT/typhoon/		●	●
	<input type="checkbox"/> TRMM Sea Surface Temperature (SST) http://www.eorc.jaxa.jp/TRMM/data/monitoring/day_vrs/index_e.htm	●	●	
	<input type="checkbox"/> Global Rainfall Map in Near Real Time http://sharaku.eorc.jaxa.jp/GSMaP/	●		
EXTERNAL	<input type="checkbox"/> Radar and Precipitation Nowcast: Japan http://www.jma.go.jp/jma/indexe.html			●
	<input type="checkbox"/> Digital Typhoon: Typhoon Images and Information http://agora.ex.nii.ac.jp/digital-typhoon/			●
	<input type="checkbox"/> Google Earth Blog : Hurricanes - Live positions (Forecast route) http://www.earthblog.com/		●	●

Generate KML - Download

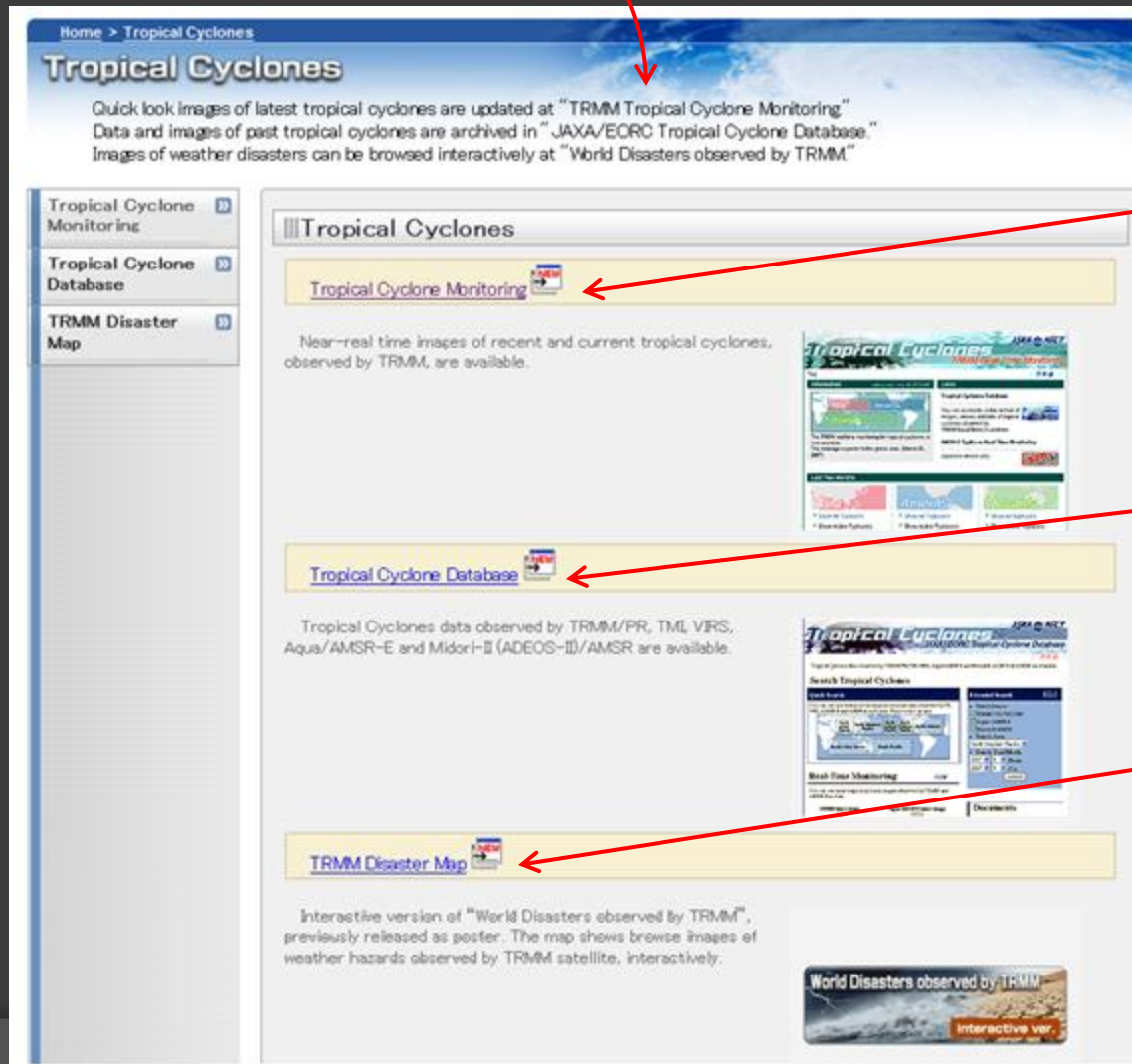
- Downloaded KML files will be connected to the latest information.
- For the information of updating, check the referred links for each KML files.
- If you failed to obtain a correct KML file, please try it again in a few minutes.

- TRMM Google Earth Lab is an efficient way of accessing near real time TRMM data in KML files for use in Google Earth
- By checking the box next to the data wanted, the user can chose data and then generate a near real time KML file, and view it in Google Earth
- The JAXA links include tropical cyclone monitoring, SSTs, and global rainfall

SST and Global Rainfall in Google Earth



TRMM – JAXA: Tropical Cyclones



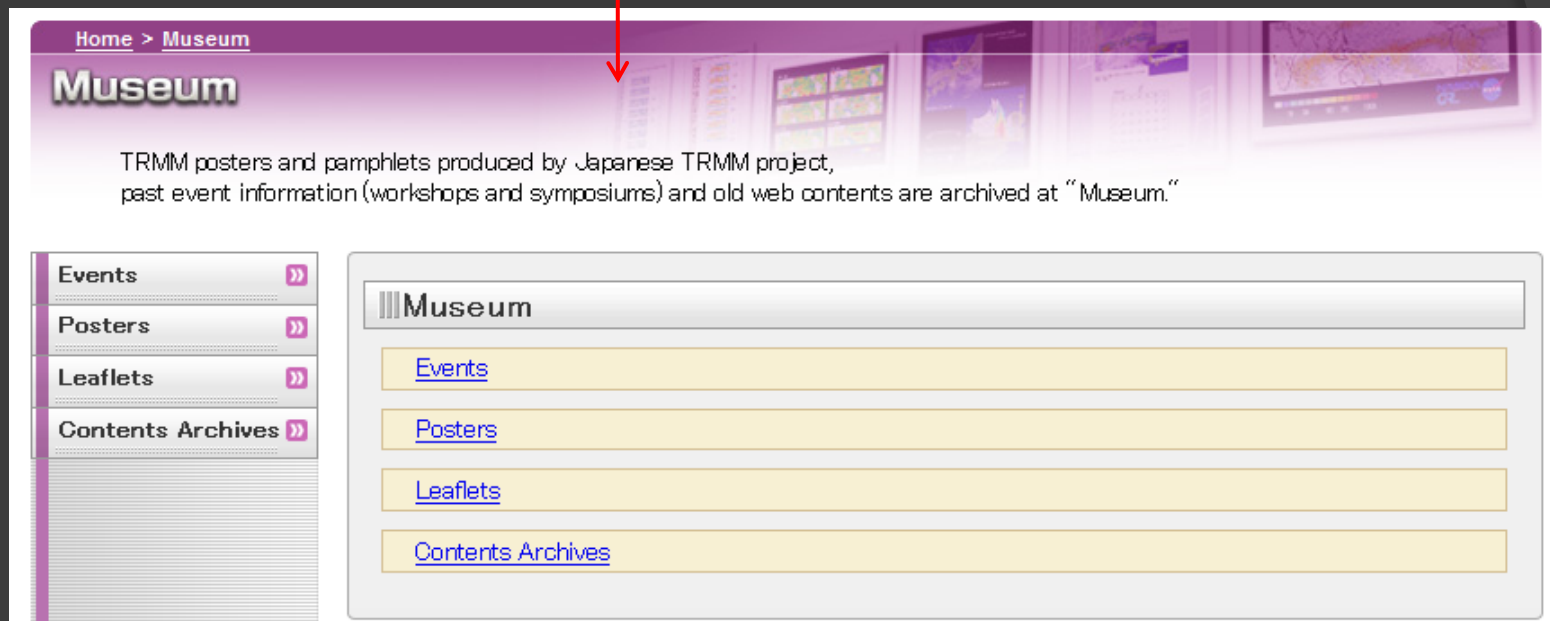
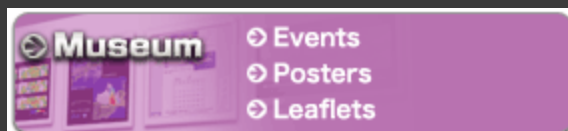
- Tropical Cyclones has links for tropical cyclone monitoring and database, as well as a disaster map
- The Monitoring link opens a new window where users can observe typhoons of the last two months over Asia, America, and Oceania
- The Database link opens a new window where users can search for tropical cyclones based on region, sensor, data, and name
- The Disaster map link opens an interactive global map where users can click around and gain information about past disasters

TRMM – JAXA: Reference Room



- Reference Room has links to more information about the satellite and its data
- Information about the satellite includes news and updates about its flight
- For a complete explanation of TRMM's products, click PR Algorithm and Product Information
- Users can access links to download data, read research announcements, or read FAQs

TRMM – JAXA: Museum



- Museum provides links to resources that were created using TRMM data
- There are links to previous events based on TRMM data, posters displaying TRMM analysis, and leaflets with examples of TRMM products

GIOVANNI

Giovanni - The Bridge Between Science and Data

You are here: [GES DISC Home](#) » Giovanni

GIOVANNI

Giovanni is a Web-based application developed by the GES DISC that provides a simple and intuitive way to visualize, analyze, and access vast amounts of Earth science remote sensing data without having to download the data.

Giovanni is comprised of a number of interfaces, called instances, each tailored to meet the needs of different Earth science research communities. To access a Giovanni instance, click on one of the four categories below.

- **Atmospheric Instances:** A-Train along CloudSat Track; Aerosol Optical Thickness Measurement and Model Comparison *Daily* and *Monthly*; Aqua/AIRS Global *Daily* and *Monthly*; Aura High Resolution Dynamics Limb Sounder (HIRDLS); Aura Microwave Limb Sounder (MLS); Aura OMI Level 3 and Level 2G; MISR *Daily* and *Monthly*; Clouds and the Earth's Radiant Energy System (CERES FM4); Modern Era Retrospective-Analysis for Research and Applications (MERRA) 3D *Monthly* and 2D *Monthly*; MODIS Terra and Aqua *Daily* and *Monthly*; Earth Probe and Nimbus-7 TOMS; Tropospheric Emission Spectrometer (TES); Upper Atmosphere Research Satellite (UARS) Halogen Occultation Experiment (HALOE).
- **Environmental Instances:** Agriculture; Air Quality; Monsoon Asia Integrated Regional Study (MAIRS) *Monthly*; Northern Eurasia Earth Science Partnership Initiative (NEESPI) *Daily* and *Monthly*.
- **Ocean Instances:** Ocean Color Radiometry (SeaWiFS, MODIS, and derived and model products); Ocean Model *Daily* and *Monthly*.
- **Hydrology Instances:** Modern Era Retrospective-Analysis for Research and Applications (MERRA) 3D *Monthly* and 2D *Monthly*; MODIS Terra and Aqua *Daily* and *Monthly*; Northern Eurasia Earth Science Partnership Initiative (NEESPI) *Daily* and *Monthly*; TRMM Online Visualization and Analysis System (TOVAS); Global Land Data Assimilation System (GLDAS) *Monthly*.

If you already know which instance to choose, please select it from the table below.

A-Train	Aerosol Daily	Aerosol Monthly	Agriculture	Air Quality
Aqua/AIRS Daily	Aqua/AIRS Monthly	Aura HIRDLS	Aura MLS	Aura OMI L3
Aura OMI L2G	CERES (FM4)	GLDAS Monthly	MAIRS Monthly	MERRA MONTH 2D
MERRA MONTH 3D	MERRA MONTH ANA	MERRA MONTH CHM	MISR Daily	MISR Monthly
MODIS Daily	MODIS Monthly	NEESPI Daily	NEESPI Monthly	Ocean Color Radiometry
Ocean Model Daily	Ocean Model Monthly	TOMS	TRMM/TOVAS	TES
UARS HALOE				

- ⦿ <http://disc.sci.gsfc.nasa.gov/giovanni>
- ⦿ Giovanni is an efficient and easy way to view and analyze data without downloading it
- ⦿ Users can access TRMM data by either clicking “Hydrology Instances” and finding the TRMM link, or simply clicking the “TRMM/TOVAS” link in the grid

GIOVANNI

TRMM Online Visualization and Analysis System (TOVAS)

TOVAS News (2010/01/25)

June 2009 TRMM 3B42 and 3B43 are in TOVAS now.

TOVAS News (2010/01/21)

TRMM 3B42 and 3B43 status: The data between July and December 2009 have arrived and are in TOVAS now. The data for the month of June 2009 are not available at this moment due to a missing data issue associated with the TRMM PR anomaly. We will post the data as soon as we receive them. Thank you for your patience.

TOVAS New Release (2008/09/12)

Giovanni TOVAS is in transition to a new web host. Two new transitioned instances of TOVAS have been released:

- [Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis \(TMPA-RT\)](#)
- [TMPA-RT Intermediate IR Product](#)
- [TMPA-RT Intermediate Microwave Product](#)
- [3-hourly product \(3B42 V6\)](#)
- [Daily TRMM and Other Rainfall Estimate \(3B42 V6 derived\)](#)
- [Monthly products \(3B43 V6, 3A12 V6, and 3A25 V6\)](#)
- [Monthly Willmott and Matsuura Global Precipitation \(1950 - 1999\)](#)

Several new functions and parameters have been added along with additional data download formats (HDF, NetCDF and KMZ).

As planned, all current TOVAS instances, listed below in this page, will be similarly converted to the [new system](#).

Welcome to TOVAS, a member of the [Giovanni](#) (GES-DISC DAAC On-line Visualization and Analysis System) family, which provides users with an easy-to-use, Web-based interface for the visualization and analysis of Earth Science data.

Note: The Java Version uses Java applet for interactively selecting an area of interest. If you have difficulties in using the Java Version, please try the Non Java Version.

Near-Real-Time Monitoring Product (For research, use Archive Data.)

Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT	JAVA Version Non JAVA Version
Daily Global and Regional Rainfall (TMPA-RT 3B42RT derived)	JAVA Version Non JAVA Version
TMPA-RT Intermediate IR Product: 3B41RT (VAR)	JAVA Version Non JAVA Version
TMPA-RT Intermediate Microwave Product: 3B40RT (HQ)	JAVA Version Non JAVA Version

Rainfall Archives

Monthly Global Precipitation (GPCP)	JAVA Version Non JAVA Version
Prototype Interactive Intercomparison of Rainfall Products	JAVA Version Non JAVA Version
3-hourly TRMM and Other Rainfall Estimate (3B42 V6)	JAVA Version Non JAVA Version
Daily TRMM and Other Rainfall Estimate (3B42 V6 derived)	JAVA Version Non JAVA Version
Monthly TRMM and Other Data Sources Rainfall Estimate (3B43 V6)	JAVA Version Non JAVA Version
Monthly Rainfall (3B43 V6) Anomaly	JAVA Version Non JAVA Version
Inter-Comparison of Rainfall Climatology	JAVA Version Non JAVA Version
Monthly TMI rain, latent heat, cloud liquid water profiles (3A12 V6)	JAVA Version Non JAVA Version
Monthly Rainfall (3A25 V6)	JAVA Version Non JAVA Version

Ground Observation Archives

Monthly Willmott and Matsuura Global Precipitation (1950 - 1999)	JAVA Version Non JAVA Version
Monthly GPCP Rainfall (1986 - Present, Monitoring Product)	JAVA Version Non JAVA Version

- Here, users can access tons of TRMM data
- The TOVAS New Release links connect to the newer version of TOVAS for easy-to-use visualization
- The second section has links to the older version, however the data is still up-to-date

GIOVANNI

- Select one of the products for analysis from the top section
- Now the user can select spatial location, parameters, date and time, and the type of visualization wanted
 - Visualizations include lat/lon maps, Hovmoller diagrams, scatter plots, time series, correlation maps, overlays, and animations
- Click “Generate Visualization” to submit

Giovanni - The Bridge Between Data and Science

+ ABOUT GIOVANNI + NEWS + INSTANCES + FEEDBACK + RELEASE NOTES + HELP

TRMM Online Visualization and Analysis System (TOVAS)

3-hourly TRMM and Other Rainfall Estimate (3B42 V6)

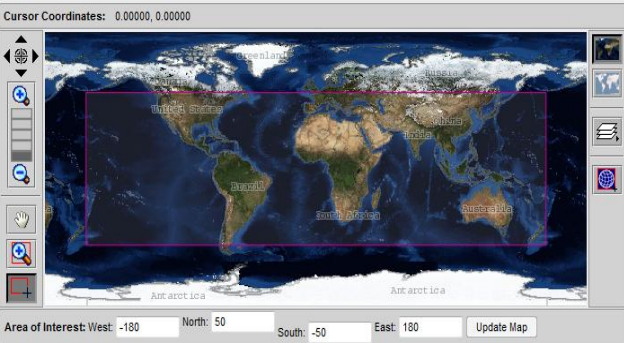
Home Remove All

This interface is designed for visualization and analysis of the 3-hourly TRMM and Other Rainfall Estimate (3B42 V6). Users can generate plots for area average (Lat-Lon Map), time series (Time Series), Hovmoller diagram and more. The animation is available for Lat-Lon Maps. Results can be downloaded in HDF, ASCII, and Google Earth KMZ formats.

Select:

Spatial

Cursor Coordinates: 0.00000, 0.00000



Area of Interest: West: -180 North: 50 South: -50 East: 180 Update Map

Parameters

Display: ☒ Data Product Info ☐ Units

Parameter	Data Product Info
<input checked="" type="checkbox"/> precipitation	TRMM_3B42.006
<input type="checkbox"/> relativeError	TRMM_3B42.006

Temporal

Begin Date Year 2010 Month Apr Day 30 Hour 00 (Date Begin: 31 Dec 1997)

End Date Year 2010 Month Apr Day 30 Hour 00 (Date End: 30 Apr 2010)

Note: This product is 3-hourly in UTC or Z.

Select Visualization:

Lat-Lon map, Time-averaged Edit Preferences Visualization Help

Generate Visualization Reset

GIOVANNI

Home

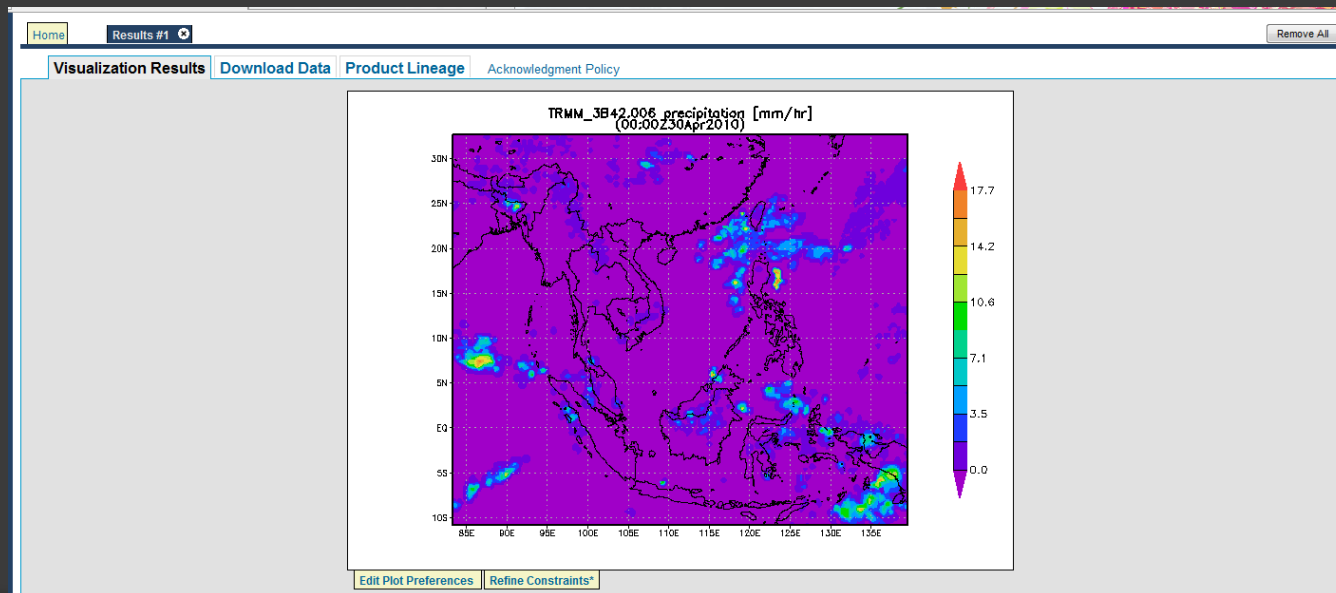
Results #1

Remove All

Execution Status

StepNumber	Operation	Status	StartTime	CompletionTime
1	Data Fetching	COMPLETE	Tue Jun 8 21:21:52 GMT 2010	Tue Jun 8 21:21:54 GMT 2010
2	Preprocessor	COMPLETE	Tue Jun 8 21:21:54 GMT 2010	Tue Jun 8 21:21:55 GMT 2010
3	Parameter Masking	COMPLETE	Tue Jun 8 21:21:55 GMT 2010	Tue Jun 8 21:21:56 GMT 2010
4	Grid Subsetter	COMPLETE	Tue Jun 8 21:21:56 GMT 2010	Tue Jun 8 21:21:56 GMT 2010
5	Anomaly	COMPLETE	Tue Jun 8 21:21:57 GMT 2010	Tue Jun 8 21:21:57 GMT 2010
6	Time Averaging	COMPLETE	Tue Jun 8 21:21:57 GMT 2010	Tue Jun 8 21:21:58 GMT 2010
7	Dimension Averaging	COMPLETE	Tue Jun 8 21:21:58 GMT 2010	Tue Jun 8 21:21:58 GMT 2010
8	Two Dimensional Map Plot	Active	Tue Jun 8 21:21:59 GMT 2010	

- Once the user clicks “Generate Visualization”, the window will have a table of actions that the computer is performing
- When it is complete, the image will appear



GIOVANNI

- Above the image, the user has the option to Download the data
- The files can be downloaded individually as HDF, NCD, or ASC, or as the final product as KMZ (for Google Earth) files

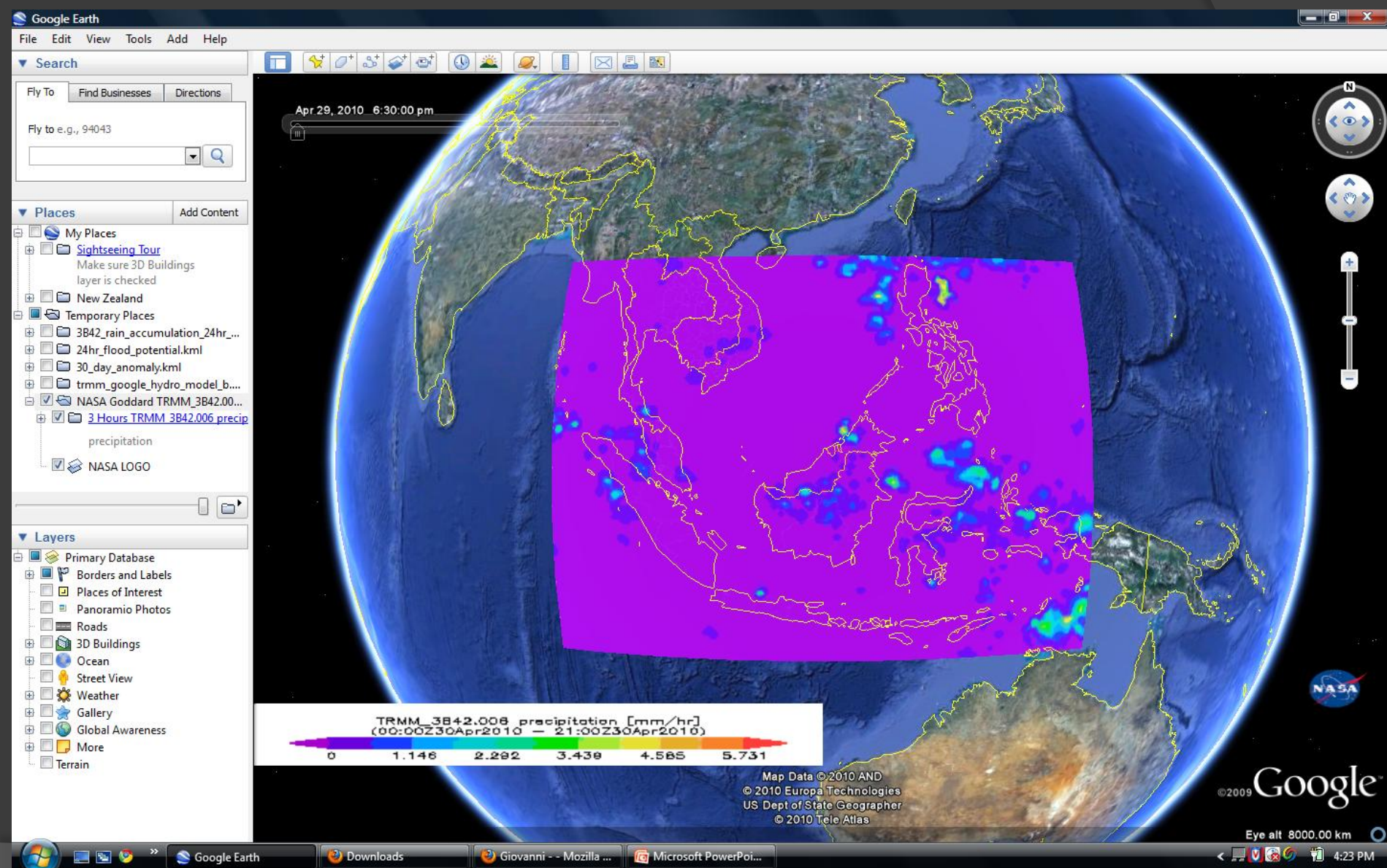
[Home](#) [Results #1](#) [Remove All](#)

[Visualization Results](#) **[Download Data](#)** [Product Lineage](#) [Acknowledgment Policy](#)

Download source data products and data products derived from Giovanni processing stages. For simplicity purposes, only the initial retrieval and final rendering phases are currently accessible for downloading. Supported download formats are HDF, NetCDF(NCD), ASCII, and KMZ (ASCII is available only when the array size is within about half-million points). To **download multiple files** at once, select the desired files (from any section) by clicking on their associated checkboxes, and then click 'Download in Batch'. **Note:** that 'n/a' means that a file size or other column value is not available; 'saa' means that a file is exactly the same as the previous one in the list. Also, not all services and data products support all download file formats.

Initial Data Retrieval			Download in Batch
Data Product	Start Time	File Size (b)	Download Files
TRMM_3B42.006 (precipitation)	2010-04-29T22:30:00Z	435561	<input type="checkbox"/> <input type="checkbox"/>
Two Dimensional Map Plot			Download in Batch
Input Files	Start Time	File Size (b)	Download Files
TRMM_3B42.006 (precipitation)	2010-04-29T22:30:00Z	25672	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Output Files			KMZ
precipitation.TRMM_3B42.006.AreaMap.2010-04-30-00:00Z.gif		24853	<input type="checkbox"/>

GIOVANNI Image in Google Earth

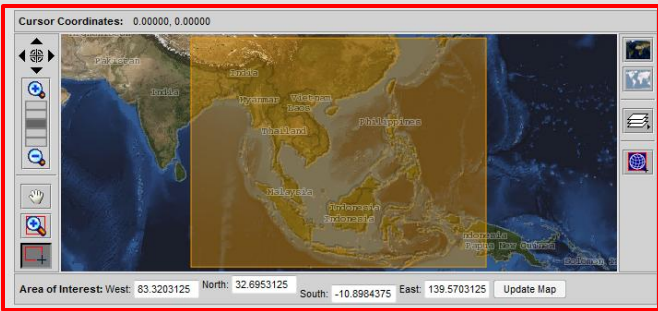


GIOVANNI

Refine Constraints [Top]:

Spatial

Cursor Coordinates: 0.00000, 0.00000



Area of Interest: West: 83.3203125 North: 32.6953125 South: -10.8984375 East: 139.5703125 Update Map

Temporal

Begin Date Year 2010 Month Apr Day 30 Hour 00 (Date Begin: 31 Dec 1997)

End Date Year 2010 Month Apr Day 30 Hour 00 (Date End: 30 Apr 2010)

Note: This product is in UTC or Z.

Edit Preferences [Top]:

Plot Preferences

Image Width 700 Set the width of the plot image (in pixels)

Image Height 500 Set the height of the plot image (in pixels)

Decoration Flag ☒ Yes ☐ No Determine whether decorations (axes reticles, labels, etc.) are displayed for the resultant images

Color Bar

Mode: ☐ Dynamic ☒ Pre-Defined ☐ Custom Select color map mode, select a palette, or, if shown in this preference bloc, specify min and max parameter value to map. The 'Palette' and Min/Max Value options are enabled only when the 'Custom' mode is selected. Values entered for 'Min Value' and 'Max Value' will override parameter specific values for parameter min and max, respectively.

Palette: Rainbow

Min Value: Overrides ALL parameter min/max values.

Max Value: Overrides ALL parameter min/max values.

Projection Equidistant Cylindrical Select a projection for the plot(s)

Smooth Flag ☒ Yes ☐ No Determine whether the pixel interpolation should use a smoothing routine

precipitation (TRMM_3B42.006) Set parameter preference values
[Return to plot](#)

Parameter Min

Parameter Max

Submit Refinements **Reset**

- Beneath the image, the user can refine constraints and edit preferences, including max and min value, color bar palette, projection type, and size

GIOVANNI

- To use the older version of data, there is a JAVA version and a non-JAVA version
- The options for creating the visualizations are the same: select area, parameters, plot type, date, and other options
- “Generate Plot” will create the visualization

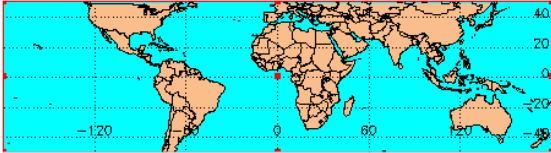
Rainfall Analysis Tools

Monthly Rainfall (3B43 V6) Anomaly

This interface is designed for visualization and analysis of the Monthly Rainfall (3B43 V6) Anomaly. Users can generate plots for area average (Lat-Lon Map), Time Series, and Hovmoller diagram. The animation is available for Lat-Lon Maps. Selecting [here](#) or the **Help** buttons will open a new window with detailed help. [More details about the data are also available.](#)

Alert: A new window may be opened when a link or a button is selected below.

Click and drag to select area; or input latitudes (-50, 50) and longitudes (-180 ~ 180) or [Click for non Java/JavaScript version](#)
[More information on supported browsers and platforms](#)



North latitude

50.0 N

West

180.0 W

East

180.0 E

South latitude

50.0 S

Zoom In

Zoom Out

Monthly TRMM 3B43(V6)

Accumulated Rainfall (mm)
Rainfall Anomaly (mm)
Normalized Anomaly (%)

Climatology

3B43 V6 (1998/01 - 2009/12)
Cort Willmott (1950/01 - 1999/12)
GPCC (1951/01 - 2000/12)

Plot Type: Lat-Lon Map

Begin Year: 2010 Begin Month: April (Data Begin: 1998/01)

End Year: 2010 End Month: April (Data End: 2010/04)

Color Options:

Dynamic
Customized (linear only): Min Max

Color Options:

Dynamic
Customized (linear only): Min Max

Time Series Plot

Y-Axis Options:

Dynamic
Customized: Min Max Interval

Generate Plot

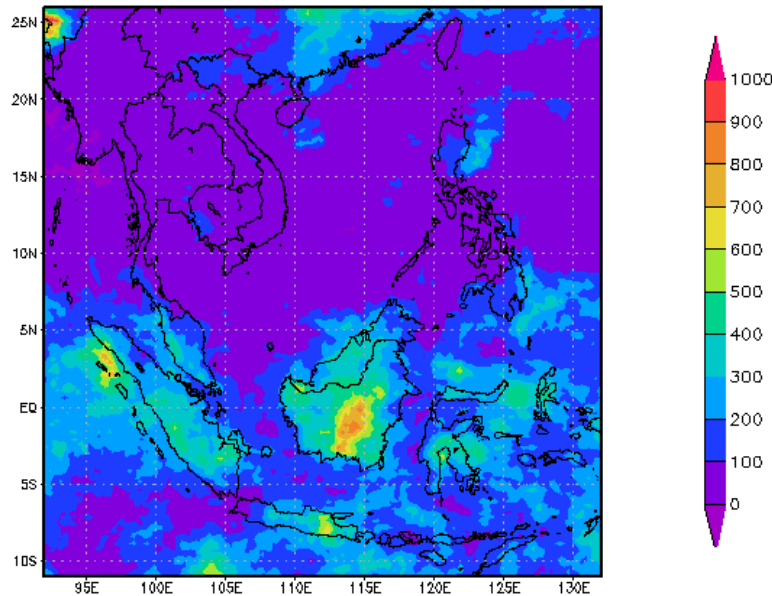
Reset Form

Help

GIOVANNI

Monthly Rainfall (3B43 V6) Anomaly Lat-Lon Map

Monthly TRMM 3B43(V6) Apr2010
Accumulated Rainfall [mm]



- The user will end up with a similar image, with options to re-generate the plot

Unit Options: ☒ mm ☐ inch

Color Options: ☒ Dynamic

☐ Customized (linear): Min Max

☐ Customized (nonlinear):

Please input numerical values separated by comma.

Hurricane Analysis Tool

First Select Data Combination

☒ Satellite Data Only ☐ Satellite and Model Data ☐ Merged IR Data

Dataset

Select base dataset: TRMM 3B42 Daily

Select overlay dataset: QuikSCAT Winds

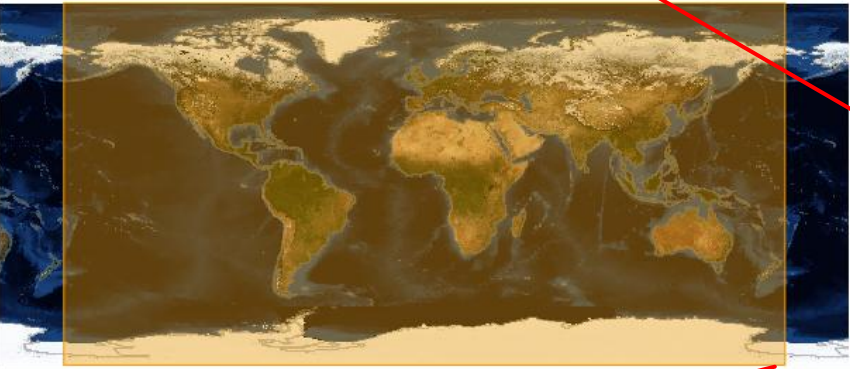
Plot Type

Plot type: Area Plot

Wind Plot type (Apply to QuikSCAT, area plot ONLY): Vector

Spatial Selection

Cursor Coordinates: 142.38281, -62.22656



Area of Interest: West: -180 North: 90 South: -90 East: 180 Update Map

Temporal Selection

You may order data from a range of days using the selection boxes below. An excessive range of days may cause processing delays or exceed the amount of data that may be ordered.

- TRMM 3B42 Daily Precipitation: 01/01/1998 - 03/31/2010
- QuikSCAT Ocean Surface Winds: 07/19/1999 - 05/31/2009
- TMI SST: 01/01/1998 - 03/31/2010

Start Yr: 2010 Start Mon: March Start Day: 31

End Yr: 2010 End Mon: March End Day: 31

Color Bar info

☒ Dynamic

☐ Custom: Min Max

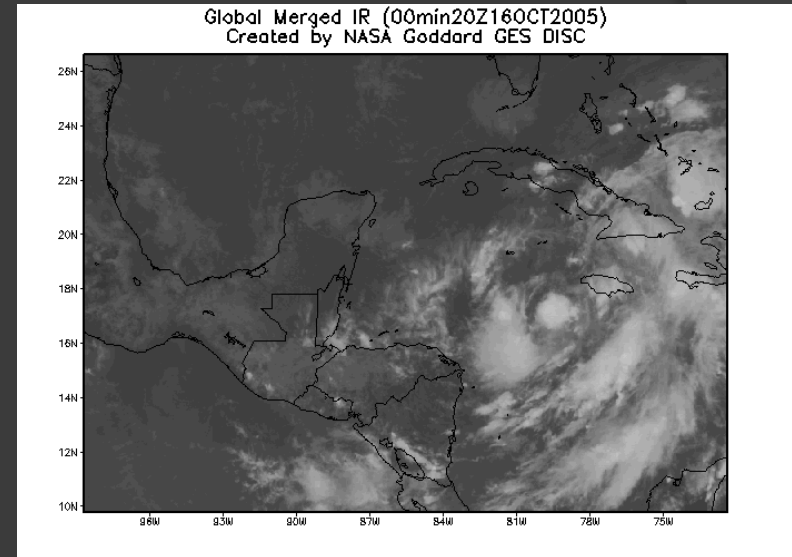
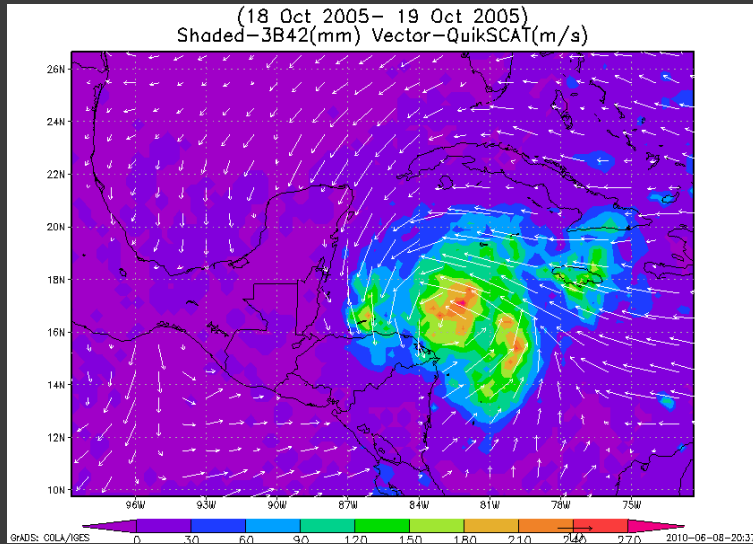
Generate Plot **Reset Form**

BETA VERSION 4.0:

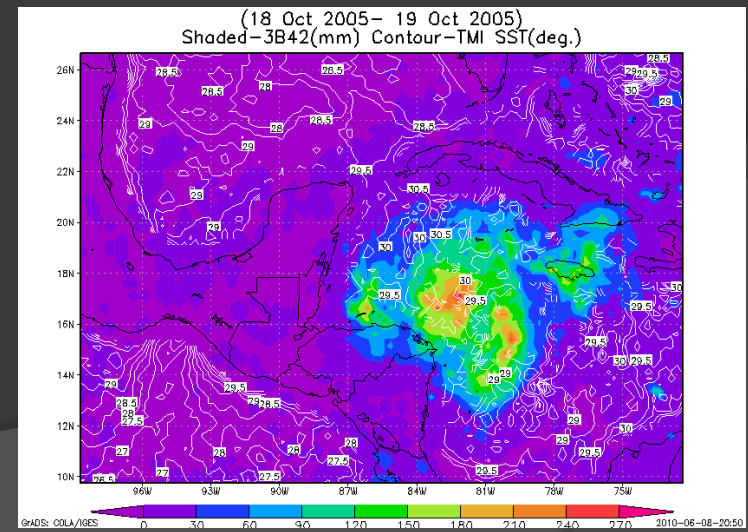
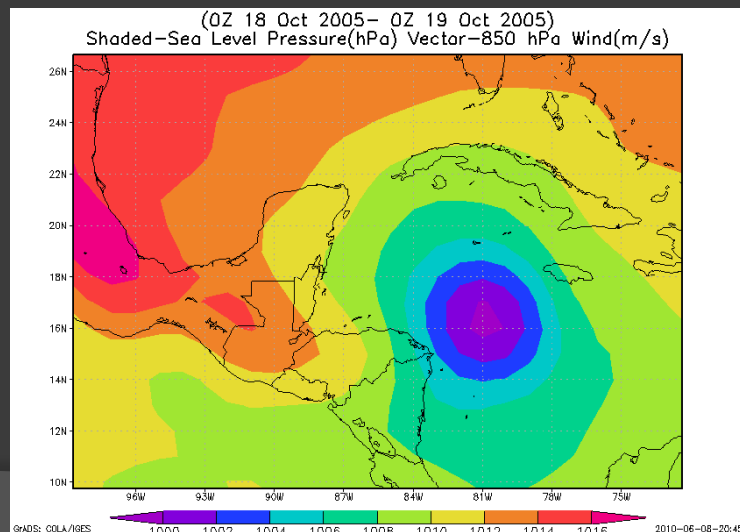
- ◉ http://disc.sci.gsfc.nasa.gov/daac-bin/hurricane_data_analysis_tool.pl
- ◉ User can select the type of data wanted
- ◉ Two Datasets (TRMM daily rainfall, SSTs, Winds)
- ◉ Type of plot (area or time; for winds vector or streamline)
- ◉ Area of interest by click and drag or entering lat/lon coordinates
- ◉ Date
- ◉ Customize color bar
- ◉ Click "Generate Plot" to obtain the map

Hurricane Analysis Tool

- The user will end up with something like this:



Images of Hurricane Wilma, October 2005



SERVIR

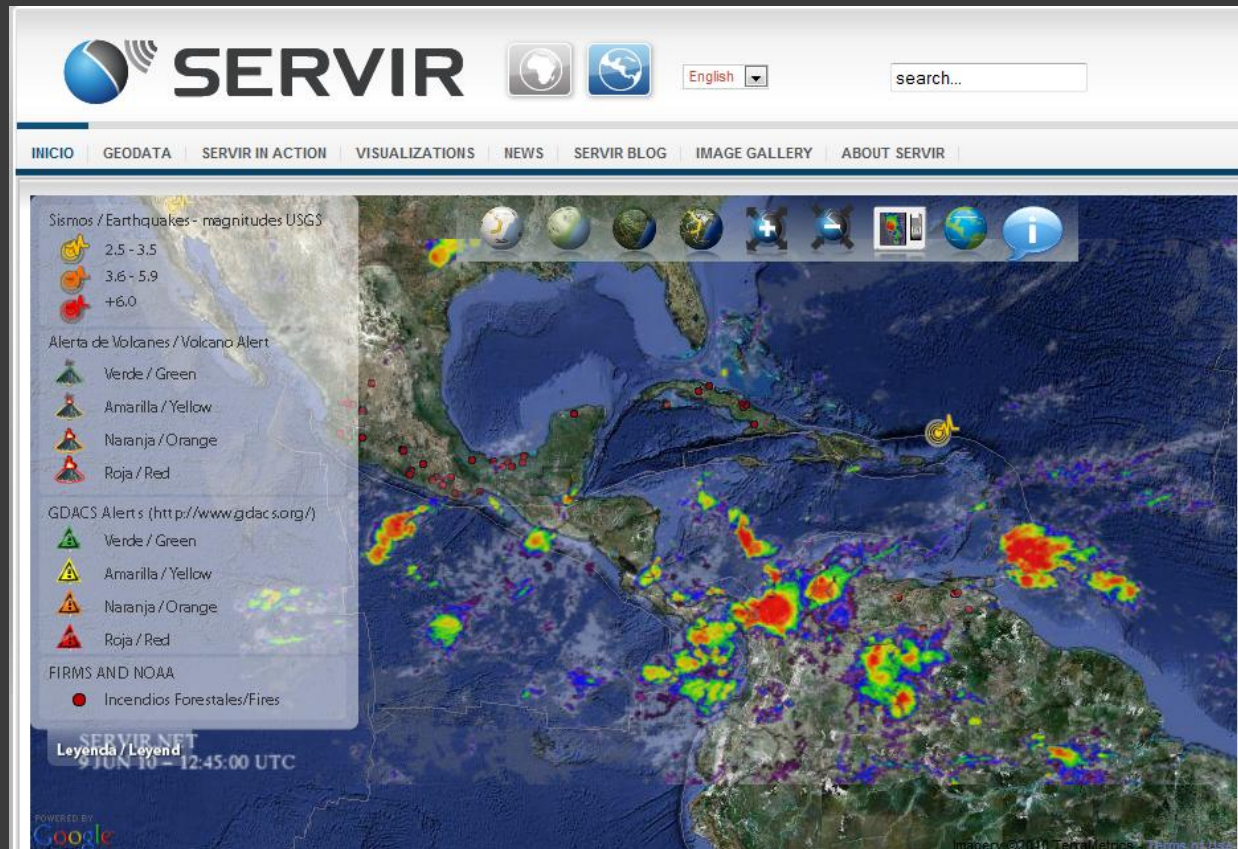
Select
language



Select region
to explore

- ◉ <http://www.servir.net/>
- ◉ SERVIR is a “Regional Visualization and Monitoring System that integrates earth observations (e.g. satellite imagery) and forecast models together with in situ data and knowledge for timely decision- making to benefit society.”
- ◉ SERVIR focuses on Mesoamerica and Africa, both developing areas
- ◉ Using the resources in SERVIR, the user can observe the threat of natural disasters in the areas, including floods, fires, earthquakes, volcanoes, and tropical storms

SERVIR



- Clicking on a portal brings the user to an interactive, animated map of the selected area
- This map shows current precipitation, earthquakes, fires, volcano alerts and GDACS alerts

SERVIR



Change map type

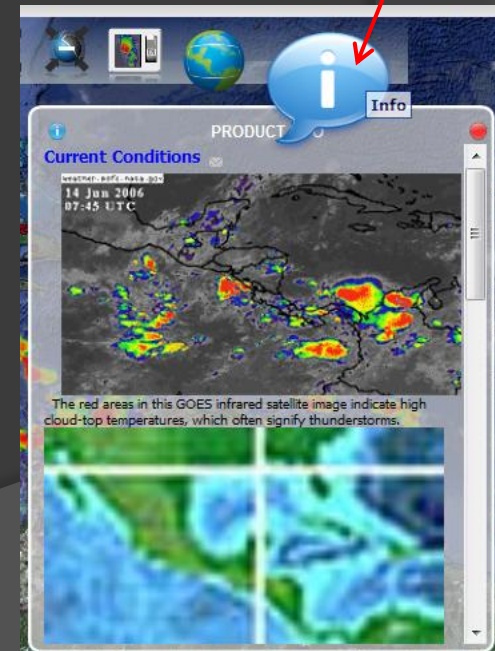
Zoom

Turn
weather
on/off

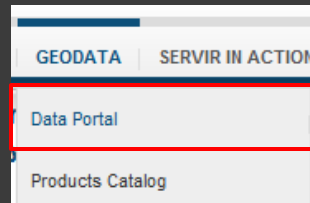
Restart
map

Info

- Click the controls to change the type of map displayed, zoom, turn precipitation on/off, restart, or get info
- Click on disasters to get information on them






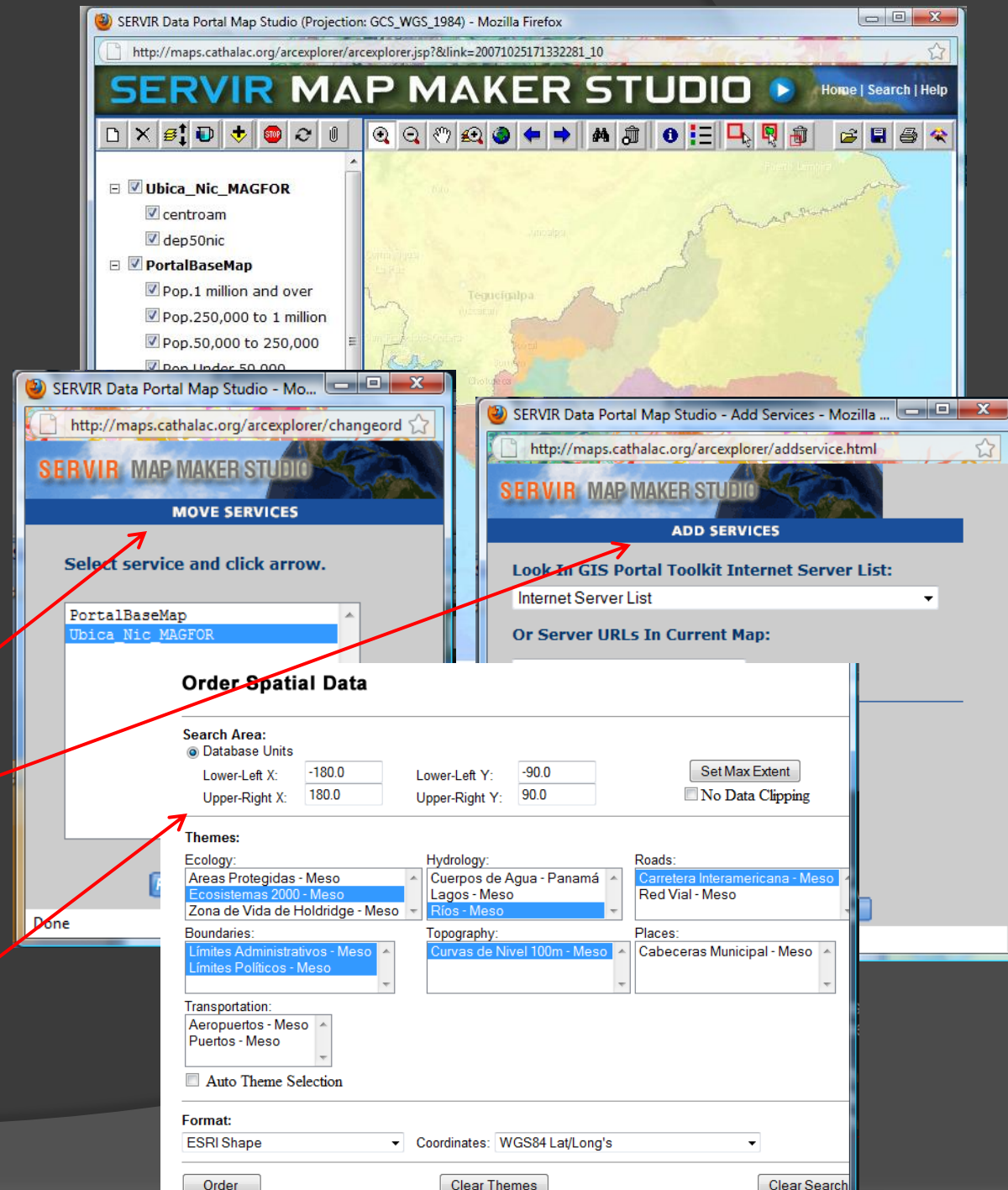
SERVIR



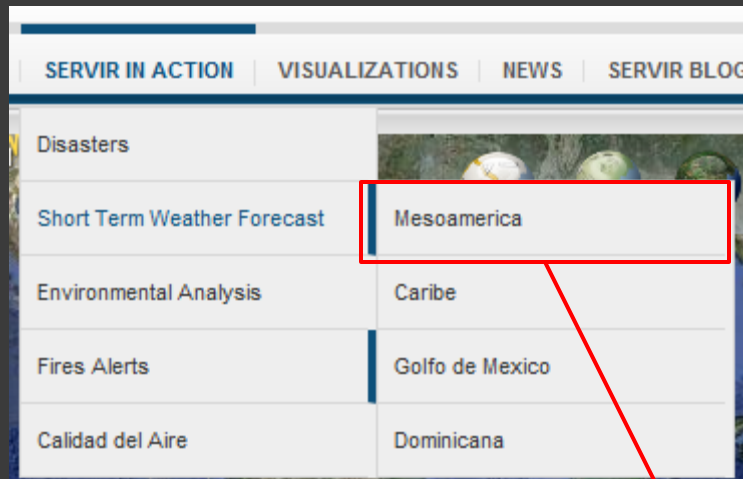
- Under the GEODATA tab, there are two links: Data Portal and Products Catalog
- Data Portal brings the user to a page where they can search for data and create a map
- The user can search by category, region, or keyword

SERVIR

- Launching the Map Viewer opens a new window with the Map Maker Studio
- The studio is very similar to GIS
- Rollover the buttons on the toolbar to see what they do
- Clicking  allows the user to move layers
- Clicking  allows the user to add layers accessible from credible websites
- Clicking  allows the user to download data



SERVIR

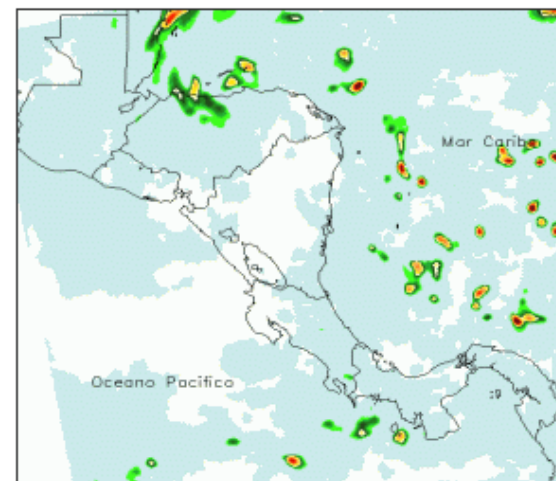


- Clicking on the SERVIR IN ACTION tab, users can view information on disasters, forecasts, environmental analysis, fire alerts, and air quality
- Under the Short Term Weather Forecast tab, users can access forecasts for specific regions

PRONÓSTICO A CORTO PLAZO "MM5" - MESOAMERICA

Short-term forecast for Mesoamerica As a result of the reinforcing the regional capacity that is part of objectives in the SERVIR project, the Panama staff produces the short-term regional weather forecasts using the PSU/NCAR Mesoscale Model, well known as MM5 in the atmospheric sciences community.

Current and previous forecasts can be viewed, animated, and downloaded from the Realtime Image Viewer. MM5 forecasts can be overlayed with other regional weather products and datasets using the free 3D SERVIR-VIZ application. Click on the SERVIR Data Portal icon and type the in keywords "Weather" to view all related weather data products.



SERVIR

- Scrolling down, users can look at maps of forecasts for that area in 11 different categories, hourly for 48 hours
- There are also animations of the data in 24 hour or 48 hour increments

Model Regions: Central America and Caribbean (27Km). Data Release Time: 2010-06-07 00:00

Next 0-24 Hours

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Dew Point	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ground Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
500mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
700mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
850mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Precipitation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2m Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vertical Velocity	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
950mb Wind&Press	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface Wind&Press	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Next 25-48 Hours

	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Dew Point	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ground Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
500mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
700mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
850mb Humid&Wind	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Precipitation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2m Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface Temp	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vertical Velocity	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
950mb Wind&Press	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface Wind&Press	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

	24 Hours Animation	48 Hours Animation
Dew Point	X	X
Ground Temp	X	X
500mb Humid&Wind	X	X
700mb Humid&Wind	X	X
850mb Humid&Wind	X	X
Precipitation	X	X
2m Temp	X	X
Surface Temp	X	X
Vertical Velocity	X	X
950mb Wind&Press	X	X
Surface Wind&Press	X	X

Previous Forecasts

Jun 6, 2010

Jun 5, 2010

Jun 4, 2010

Jun 3, 2010

Jun 2, 2010

Jun 1, 2010

Visualization | News | Settings

>Map viewer

SERVIR Viz (3D)

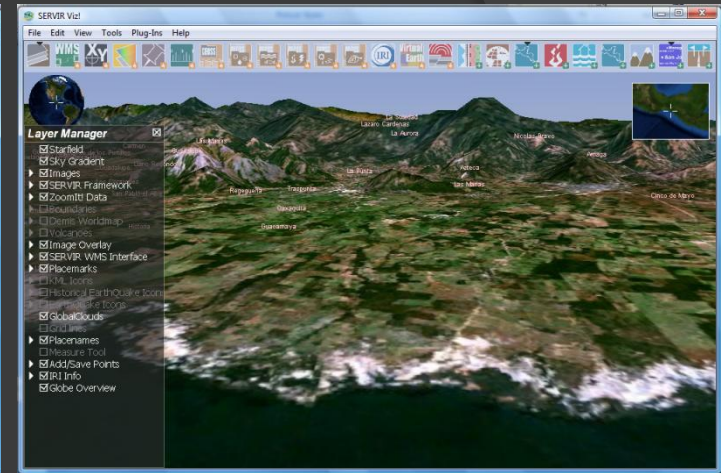
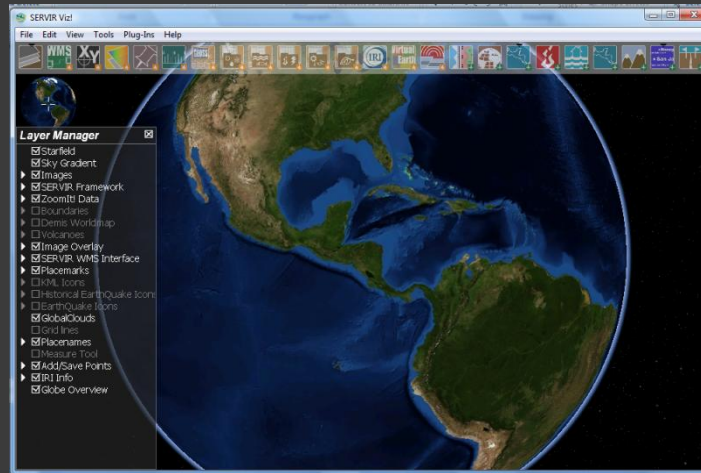
90-day forecast for the 30th of the month



KML

- Clicking on the VISUALIZATIONS tab, there are two options: Map Viewer and SERVIR Viz
- Map Viewer opens a new window, with an interactive animated map similar to the one on the portal homepage
- This map has more options:
 - Menu – with the ability to search and add layers of different data
 - KML – export the map to Google Earth













SERVIR



- SERVIR Viz is a free, downloadable program that is a modification of NASA World Wind software
- The program looks like Google Earth, but is specific to Mesoamerica and Africa
- It can be downloaded by clicking the tab "SERVIR Viz" under VISUALIZATIONS and clicking the download link on that page
- SERVIR Viz includes the same data and options as the Map Viewer, it is simply a 3-D view



SERVIR VIZ Toolbar Icon Explanations

	Layer Manager - Turns the Layer Manager on and off in the SERVIR-Viz window. The Layer Manager contains a number of data layers and other features that can be turned on and off.
	SERVIR WMS Interface - Allows SERVIR-Viz to browse SERVIR WMS server archives and their contents.
	Zoom to Location - Zooms SERVIR-Viz to a Latitude and Longitude location based on user input.
	Image Overlay - Allows user to load images including 2D maps onto the SERVIR-Viz terrain.
	Placemarks - Allows user to mark places of interest on the SERVIR-Viz terrain and export the locations to a Google Earth .kmz file.
	Measure Tool - Allows user to measure a point to point distance in meters and provides the bearing in degrees.
	GEOSS Decision Support - Provides the user with Global Earth Observation System of Systems (GEOSS) data to look at together and study their interactions on the SERVIR-Viz terrain.
	GEOSS Weather - Provides a direct link to GEOSS weather data to be viewed in SERVIR-Viz.
	GEOSS Ocean/Marine Environments - Provides a direct link to GEOSS ocean and marine environment data to be viewed in SERVIR-Viz.
	GEOSS Disasters - Provides a direct link to GEOSS disaster data to be viewed in SERVIR-Viz.
	GEOSS Climate - Provides a direct link to GEOSS climate data to be viewed in SERVIR-Viz.
	GEOSS Ecology - Provides a direct link to GEOSS ecology data to be viewed in SERVIR-Viz.

	Climate Mapper - The Climate Mapper was developed for SERVIR-Viz to give project designers access to historical weather data as well as projections of climate change. The data are available for an area of about ½ degree ½ degree, or roughly 50km x 50km near the equator. When you click on the map, the tool will pull data for the grid cell surrounding the point where you clicked and display it as a line graph. The data can be exported to a spreadsheet application.
	IRI Data Access - Allows users to view data provided by The International Research Institute for Climate and Society (IRI), for the African region. In SERVIR Viz, you can view the IRI maps for a given date range, and click on points in Africa to generate graphs for the area. Products include: Malaria Early Warning System, and Desert Locust Area maps.
	Historical Earthquake Query - Allows the user to search USGS Earthquake data with many variables (i.e. geographic area, time, magnitude, etc.) and displays results on the SERVIR-Viz terrain.
	Virtual Earth - Connects to and uses data from Microsoft Local Live databases. This includes street maps, USGS imagery, and hybrid maps. Provides adjustable data visibility levels and an address finder.
	Demis Worldmap - Adds a world map on the SERVIR-Viz terrain that includes hydrography, cities, airports, roads, and relief shading.
	Topo Sheets - Adds topographic maps to the SERVIR-Viz terrain for Mesoamerican countries.
	Vector Layers - Activates the Vector Layers under SERVIR Framework in the Layer Manager. The layers here include Main Roads, Rivers, Lakes, Watersheds, etc.
	Fire Alerts - Activates the Fire Alerts layer under SERVIR Framework in the Layer Manager. The layer includes data from the past 24 hours or the last 7 days.
	Floods - Activates the Floods layer under SERVIR Framework in the Layer Manager. The layer includes data from the last 14 days, labels for the flood areas, and historical data from years past.
	Volcanoes - Activates the Volcanoes layer in the Layer Manager. The layer includes data on volcanoes categorized by the country where they are located. Tooltips about each location are visible when label is hovered over with the cursor. Clicking the label activates a hyperlink to get more specific information.
	Placenames - Labels cities, counties, and countries based on the current zoom level.
	Boundaries - Draws country boundaries and U.S. State boundaries.

SERVIR


IMAGE GALLERY ABOUT SERVIR

Anaglyphs

SERVIR is pleased to provide the first set of 3-D "anaglyph" posters of the Central American countries developed from NASA's Shuttle Radar Topography Mission (SRTM). To view these images in 3-D, you need special red/blue anaglyph glasses.

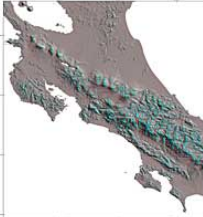
Screen views and full-size anaglyph posters are in JPEG format. The screen views are NOT designed to be viewed in 3D and serve only as a reference. The full size posters can be viewed in 3D on a computer screen at full resolution, but they are ideally designed to be plotted on 36" x 48" paper.

Mesa 3D - Belice
Misión de Radar Topográfico del Transbordador Espacial (SRTM)



Belice
Screen View (441 KB)
Full-size poster (8.33 MB)

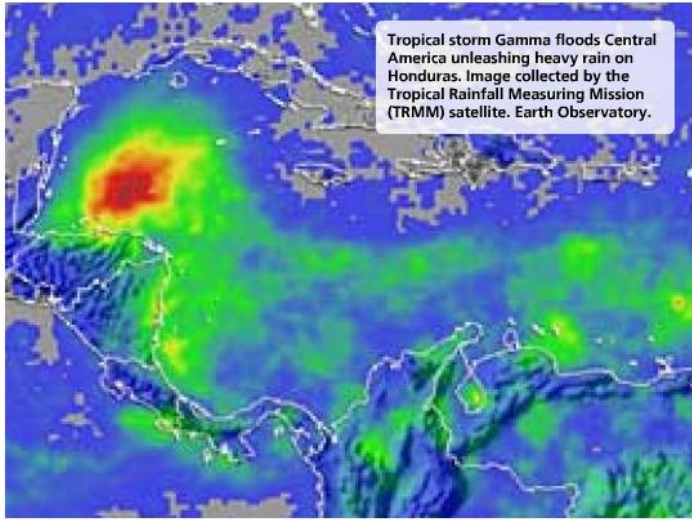
Mesa 3D - Costa Rica
Misión de Radar Topográfico del Transbordador Espacial (SRTM)



Costa Rica
Screen View (392 KB)
Full-size Poster (8.97 MB)

Satellite Images

Centroamerica - TRMM



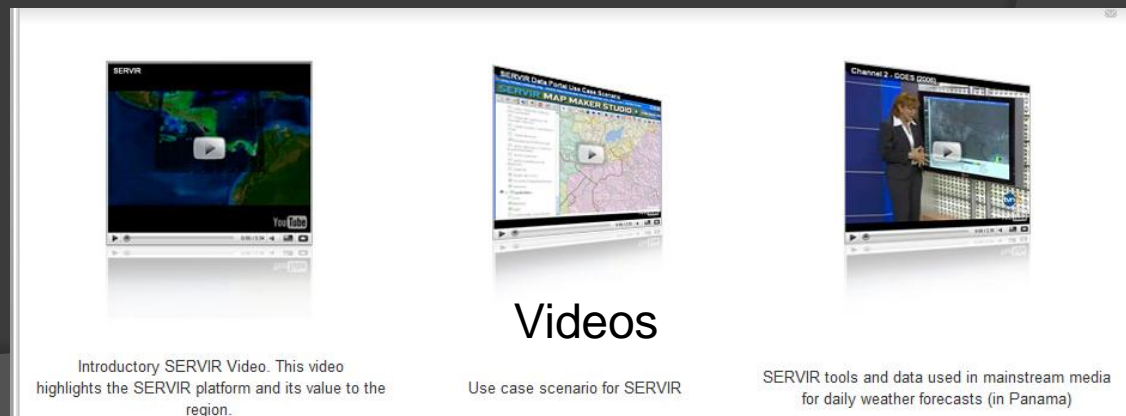
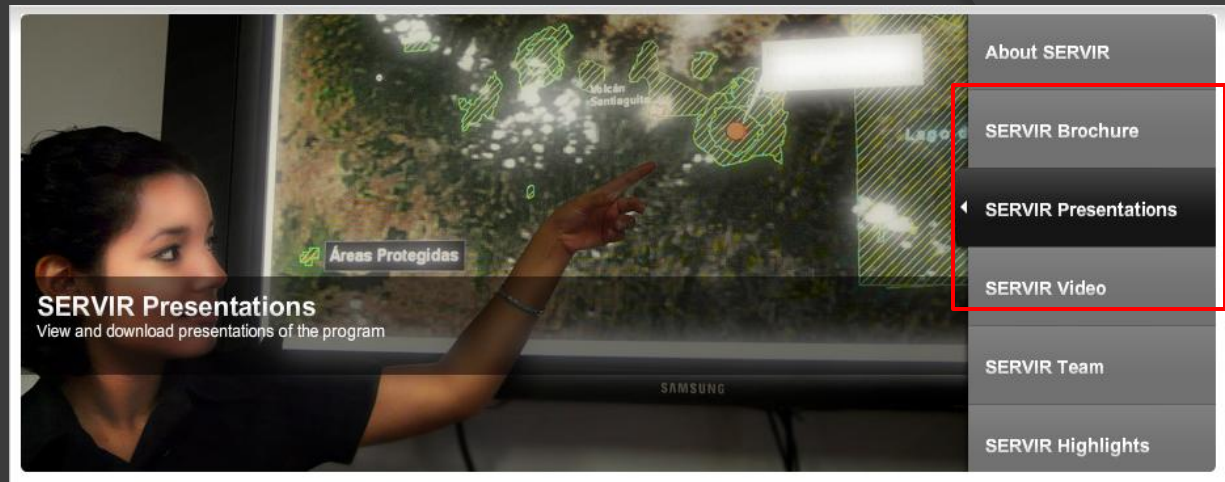
Tropical storm Gamma floods Central America unleashing heavy rain on Honduras. Image collected by the Tropical Rainfall Measuring Mission (TRMM) satellite. Earth Observatory.

/35 >> Estas viendo: Galeria

- The tab "IMAGE GALLERY" has links to anaglyphs and satellite images of environmental issues
- Users can view the anaglyphs and print them

SERVIR

- For more information about SERVIR, check out the brochure, presentations, and video



NASA Earth Observations (NEO)

NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NEO NASA Earth Observations

Home News WMS Help About NEO Subscribe

Tip: New dataset: Land Surface Temperature Anomaly (both day and night). See the 'Land' tab below.

Atmosphere

Atmosphere Datasets

- Aerosol Optical Thickness (MODIS)
- Aerosol Particle Radius (MODIS)
- Carbon Monoxide (MOPITT)
- Cirrus Reflectance (MODIS)
- Cloud Fraction (MODIS)
- Cloud Optical Thickness (MODIS)
- Cloud Particle Radius (MODIS)
- Cloud Water Content (MODIS)
- False Color (MODIS)
- Total Rainfall (TRMM)**
- True Color (MODIS)
- Water Vapor (MODIS)

Blue Marble: Next Generation (Terra/MODIS)
December 1, 2004 00:00-January 1, 2005 00:00
[About this dataset](#)

Search Results

December 1, 2004 00:00 to January 1, 2005 00:00

Search Parameters

Coverage

Region: Global

Duration: day

Date Range

Start: [] [] []

End: [] [] []

Clear Form

Search NEO

Download Options

Full Color

JPEG

Get Image

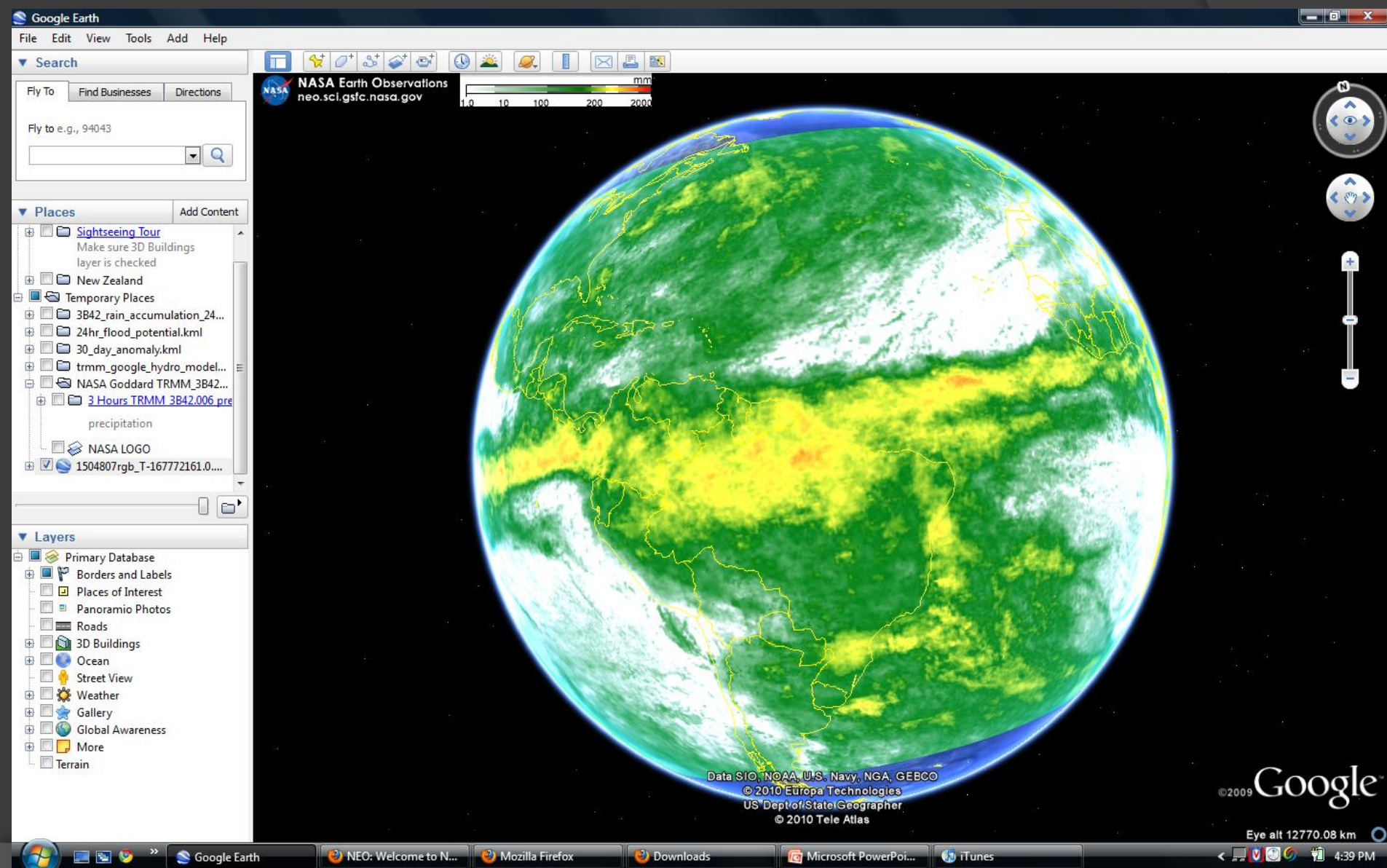
Analysis Matching Datasets

Blue Marble: Next Generation +Topo+Bathy (Terra/MODIS)

Select

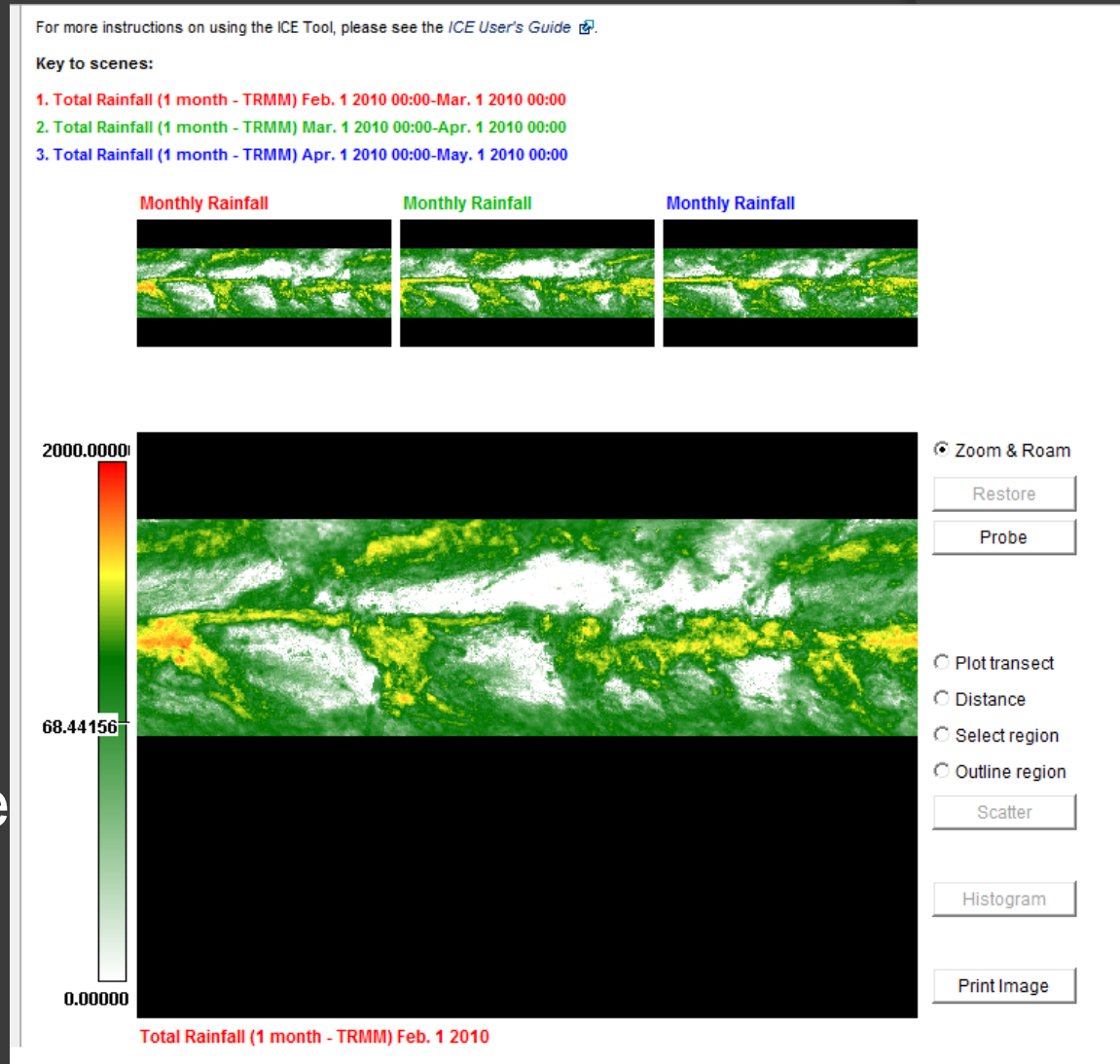
- <http://neo.sci.gsfc.nasa.gov/Search.html>
- Provides global maps using a variety of datasets, including TRMM
- Expand "Search Parameters" to choose coverage, date range, and lat/lon range to search for data
- Access TRMM by clicking the Atmosphere tab, followed by Total Rainfall (TRMM)
- Can download the data in multiple file types, including Google Earth
- Can also perform analysis on 1-3 images and get matching datasets

NEO Image in Google Earth



NEO Analysis

- By selecting 1-3 images from the Search results boxes, the user can analyze the TRMM data alone or with other maps
- It uses the ICE tool, and creates transects, scatter plots, and histograms, allowing the user to select the area for analysis, zoom, probe, and print image



Global Precipitation Analysis (GPCP)

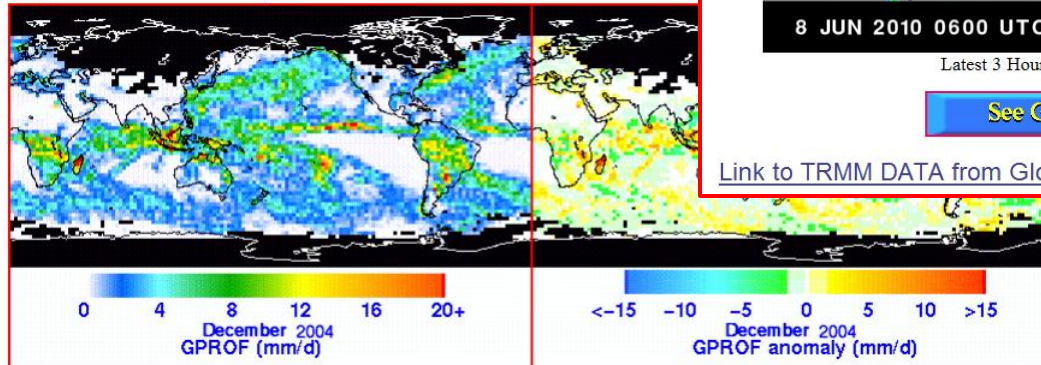
- ◎ The Global Precipitation Climatology Project (GPCP) is a project whose goal is to develop a better understanding of global precipitation
- ◎ GPCP uses data from rain gage stations and satellites (including TRMM) to estimate global monthly rainfall from 1979 to present
 - Over 6,000 rain gage stations
 - Geostationary and low-orbit infrared, passive microwave, and sounding observations from satellites
- ◎ For a complete list and explanation of the data products, visit
<http://lwf.ncdc.noaa.gov/oa/wmo/wdcamet-ncdc.html>

Global Precipitation Analysis (GPCP)

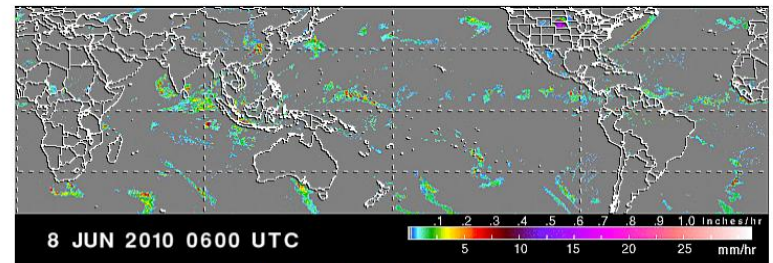
Global Precipitation Analysis

Laboratory for Atmospheres
NASA Goddard Space Flight Center

- Global Real-Time 3-Hourly Precipitation Analysis of **TRMM DATA**
- Global Monthly Merged Precipitation Analyses of GPCP ([1979-present](#))
- Global Daily Merged Precipitation Analyses of the GPCP ([1997-present](#))
- Monthly and Pentad SSM/I-based Precipitation Analyses using GPROF6
- ENSO Precipitation Analyses (Research and Monitoring)
- Precipitation patterns in the tropical Pacific over the [last 12 months](#)



3-hr Realtime Rainfall Analyses



Latest 3 Hourly "Merged" Global precipitation Image

[See Global Rain Animation](#)

[Link to TRMM DATA from Global Real-Time 3-Hourly Precipitation Analyses](#)

- <http://precip.gsfc.nasa.gov/>
- Clicking "TRMM DATA" brings the user to a real-time global map of precipitation
- By clicking the link beneath the map, an animation of about a week of recent global precipitation is generated
- The user can also access the TRMM data

Global Precipitation Analysis (GPCP)

Tropical Rainfall Measuring Mission (TRMM)

Monthly Data	Pentad Data	3-Hourly Data	Near-Real-Time	Climatology
Summary		Summary	Summary	
Data		Data	Data	
Images			Images	

Scrolling down to the bottom of the homepage, there is a variety of TRMM links including Summary, Data, and Images of monthly, 3-hourly, and near-real-time data

- Summary is a written description of the data and how it is compiled
- Data is the actual data files
- Images shows global images of the data
 - Monthly data images displays monthly averages of the TRMM precipitation data from 1998 to 2009
 - Near-Real-Time images displays the same page as the TRMM DATA link at the top of the page

Remote Sensing Systems

- <http://remss.com>
- This tool looks at the data collected from the TRMM's TMI instrument
 - Includes SST, surface wind speed, atmospheric water vapor, cloud liquid water, and rain rate
- The description link provides an in depth explanation of the data and products featured on the page

The screenshot displays the Remote Sensing Systems website. The top navigation bar includes links for SSM/I, TMI, AMSR, QSCAT, MSU, Storm Watch, RSS Research, Support, and Site Map. A central banner features a globe and several satellite images. Below this, a list of instruments is shown with links to their respective data pages: SSM/I, TMI, AMSR, QSCAT, and MSU. The TMI section is highlighted with a red box, and a red arrow points from the 'Description' link in the TMI section to the 'Description of TMI Data Products' page. This page lists several topics: Version Notes, Introduction, Sea Surface Temperatures, Other Geophysical Parameters, Binary Data Files, Graphic Image Maps, and Acknowledgement.

Remote Sensing Systems

Home About RSS Contact RSS

SSM/I TMI AMSR QSCAT MSU

Storm Watch RSS Research Support Site Map

Research-quality geophysical products from satellite data

SSM/I DATA SSM/I DATA SSM/I

> Description > Browse Data > Validation

Want the entire 20-year SSM/I dataset at your institution?

TMI DATA TMI DATA TMI

> Description > Browse Data > Validation

AMSR DATA AMSR

> Description > Browse Data

QSCAT DATA QSCAT

> Description > Browse Data

MSU DATA MSU DATA MSU

> Description > Browse Data > Validation

Description of TMI Data Products

- [Version Notes](#)
- [Introduction](#)
- [Sea Surface Temperatures](#)
- [Other Geophysical Parameters](#)
- [Binary Data Files](#)
- [Graphic Image Maps](#)
- [Acknowledgement](#)

Temperature (SST)

Data > Validation

n ≈ Precipitation

Download Data

Remote Sensing Systems



Browse / Download TMI Data

Sea Surface Temperature (SST); Surface Wind Speed; Atmospheric Water Vapor;
Cloud Liquid Water; Rain Rate

Pre-rendered Data Images:

GIF data resolutions (pixels):
400 x 100; 1440 x 320

- [Daily](#)
- [3-Day](#) (good for viewing SST)
- [Weekly](#)
- [Monthly](#)

Dynamic Data Imaging:

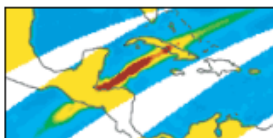
Focus in on a particular region.
Subsetting, Zooming and Statistics

- [Daily](#)
- [3-Day](#) (good for viewing SST)
- [Weekly](#)
- [Monthly](#)

FTP Data Directly:

- <ftp.ssmi.com/tmi>

- [TMI Sea Surface Temperature \(SST\) Real-Time Validation Statistics](#)



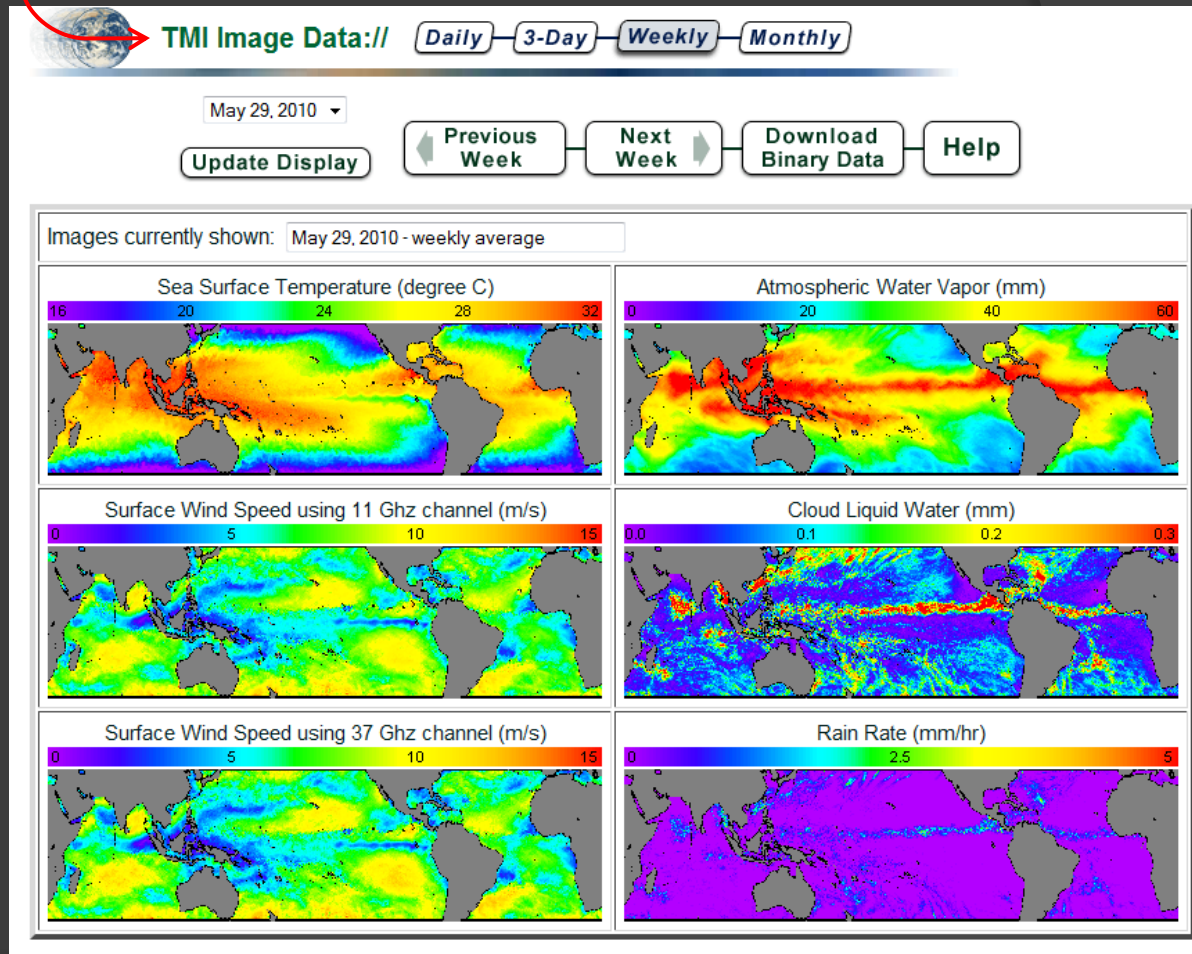
- [***TMI Captures Reflection of Largest Recorded Solar Flare***](#)

- Browse data link opens a page where the user can view and download pre-rendered and dynamic data images
- Each link looks at the SST, surface wind speed, atmospheric water vapor, cloud liquid water, and rain rate over the oceans only, for the time period specified

RSS – Pre-rendered Images

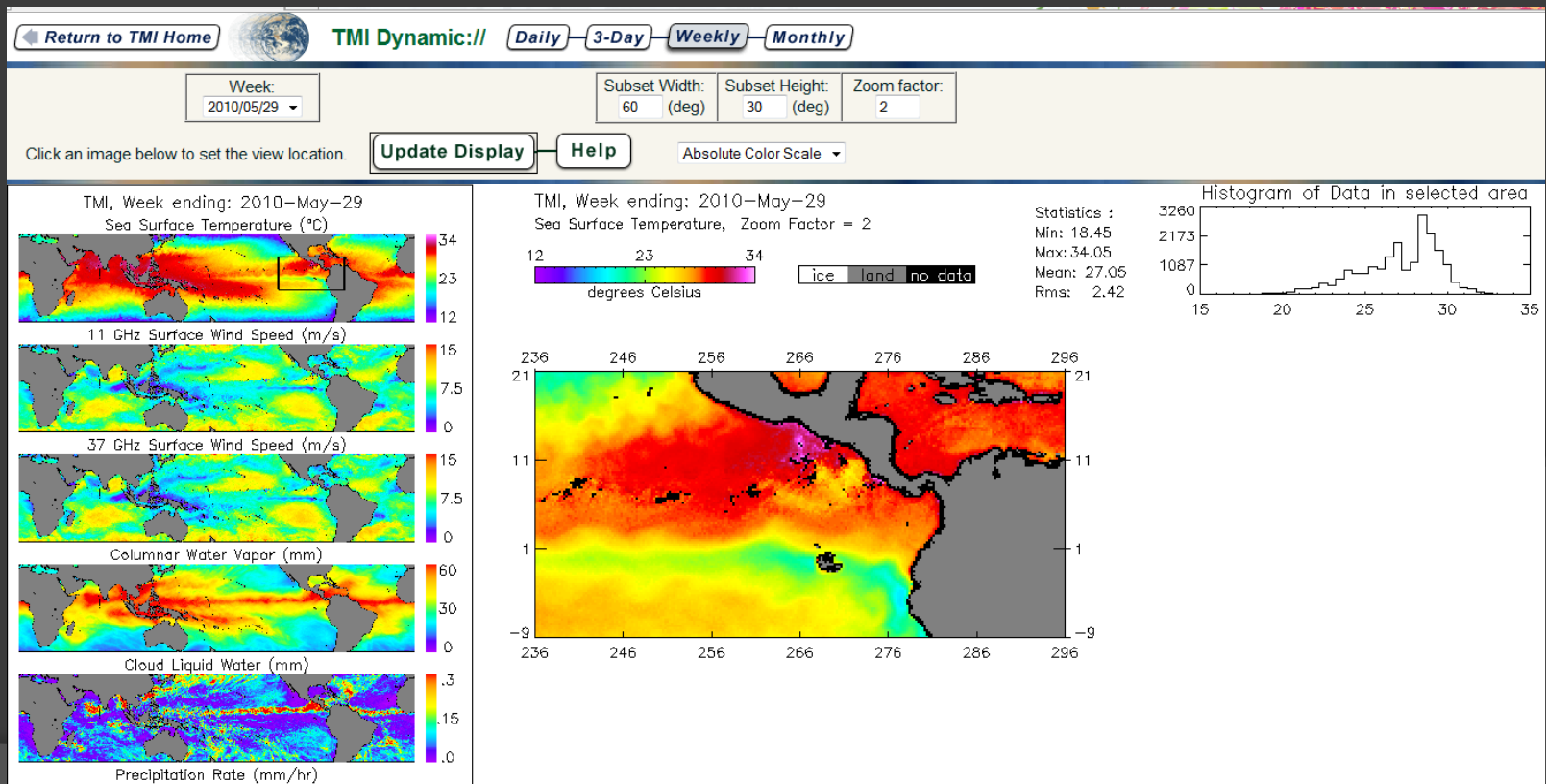
- Pre-rendered images allows the user to select the date of data collection (pass and time can be selected for daily data only)
- Clicking on a map opens a larger version of it
 - The user can download any of this data by clicking the link “Download Binary Data”

This link bar allows for easy navigation between Daily, 3-Day, Weekly, and Monthly data



RSS – Dynamic Data Imaging

- Dynamic data imaging allows the user to select the date and region to analyze
- It also provides the user with statistics and a histogram of the data selected



RSS - Validation

http://remss.com/tmi/tmi_validation.html



TMI Data Validation

RSS performs extensive algorithm validation to determine the quality of our data. We maintain a dataset of over 8 million buoy observations to use in validating the TMI products we produce.

[> Version-3a TMI Sea Surface Temperature \(SST\) Realtime Validation Statistics](#)

[> Validation of Version-2 TMI Sea Surface Temperature \(SST\)](#)

[> Validation of Version-2 TMI Wind Speeds](#)

[TOP ↑](#)

Validation of Version-2 TMI Sea Surface Temperatures

Validation of satellite-derived SSTs is necessary to check the retrieval algorithm developed for the TMI 10.7 GHz channel. The validation process includes comparison of TMI SSTs to *in-situ* measurements made by moored buoys located in both the tropical Pacific and tropical Atlantic oceans.

The tropical Pacific moored ocean buoys consist of mostly TAO array buoys. Hourly data from the approximately 60 buoys that make up the array are obtained from the [Pacific Marine Environmental Lab \(PMEL\)](#). The remaining Pacific Ocean buoys are operated by the [National Data Buoy Center \(NDBC\)](#). The NDBC provides data from moored buoys along the US coasts and have approximately 20 buoys greater than 35 km from land on the Pacific (8) and Atlantic (11) coasts. We also compare our TMI SSTs to daily SST observations from the PIRATA buoys moored in the tropical Atlantic Ocean.

Data comparisons are made for the December 1997 to June 1999 time period. During this time we have over 9000 TMI to TAO/NDBC buoy collocations and approximately 1500 PIRATA daily collocations. TMI and buoy SST collocations were used only for rain-free atmospheric conditions. We found small differences between the TMI and buoy SSTs. The TMI minus TAO difference when averaged over all buoys is 0.1 degree Celsius and the mean TMI minus NDBC SST difference is 0.2 degree Celsius. The standard deviation for both was approximately 0.5 degree Celsius. Slightly better results were found when we averaged the hourly TAO/NDBC data to daily values and compared them with TMI 3-day mean SSTs. The [PIRATA buoy data](#), though fewer in number, on average showed no difference from the TMI SSTs, and had a standard deviation of 0.4 degree Celsius.

A time series of two Central Pacific buoys located within 0.1 degree longitude of each other and TMI SST

http://remss.com/tmi/tmi_sst_validation_statistics.html



TMI SST Near Real-Time Validation Statistics

[> TMI SSTs Compared with In Situ Observations](#)

[> TMI SSTs Compared with Reynolds SSTs](#)

[TOP ↑](#)

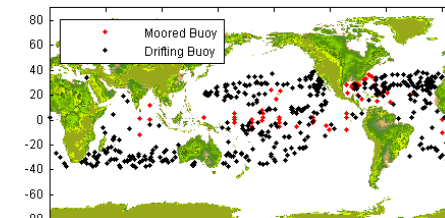
TMI SSTs Compared with In Situ Observations

Near real-time (NRT) in situ observations are downloaded from the Global Ocean Data Assimilation Experiment (GODAE) Monterey server, which is sponsored by the Office of Naval Research (ONR) and hosted by the Fleet Numerical Meteorology and Oceanography Center (FNMOC). These observations are obtained by FNMOC from the GTS and processed for the GODAE server. Observations from ship engine room intake, fixed buoy, drifting buoy, ship hull sensors, and CMAN stations are included in the dataset. See the [USGODAE Project](#) for the complete SURFOBS dataset and a detailed description.

To perform this comparison with TMI, in situ observations are collocated with the closest TMI SST observations (within 25 kilometers; to the nearest TMI observation time). The complete collocated dataset is available below in text format, but for a quick understanding of the NRT error statistics, the previous 50-day bias and standard deviation are plotted below.

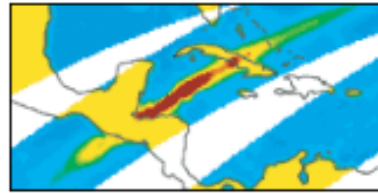
[TOP ↑](#)

In Situ Data Collocations for the Most Recently Completed Day:



From the homepage link, “Validation” and also the SST Validation link on the Browse Data page, the user can access text, statistics, and figures that validate the data compiled on the website

RSS – Did you know?



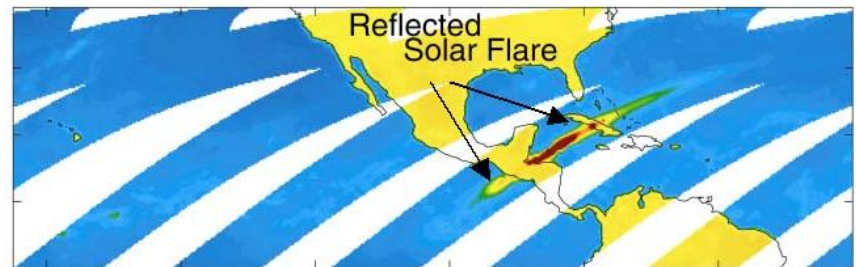
► TMI Captures Reflection of Largest Recorded Solar Flare

- At the bottom of the Browse Data page, there is a link describing how the TMI instrument captured the reflection of the largest recorded solar flare on November 4, 2003



TMI Views Solar Flare

TMI Captures Ocean Reflection of Largest Recorded Solar Flare



TRMM TMI 11 GHz VPol Antenna Temperatures

On November 4, 2003, at approximately 19:47 UTC, the largest solar flare event ever recorded erupted. The extremely intense radiation coming from the flare saturated x-ray detectors for 11 minutes. The same hyper-accelerated solar electrons that are responsible for the x-ray burst also emit intense microwave radiation. This burst of solar microwaves, traveling from the sun to the Earth in 8 minutes, reflected off the ocean surface and was seen by the TRMM microwave imager (TMI). The radiation was so intense that it saturated the 11-GHz TMI channels.

Remote Sensing Systems (RSS) detected this event during a routine data quality check that revealed anomalous geophysical retrievals. RSS processes TMI data into a suite of ocean products, including ocean temperature, wind speed, atmospheric water vapor, cloud, and rain rates, for use in weather forecasting, climate modeling, and scientific research. The erroneous ocean retrievals were traced back to exceptionally high microwave radiances coming from the solar flare.

Imagine looking at the ocean on a sunny day. When you look at a certain angle, you see the sun's reflection. This angle is the specular reflection angle. Occasionally the satellite's viewing angle matches the specular reflection angle. Serendipitously, TMI was looking at the specular reflection of the sun at the time of the solar flare event. The 11-GHz solar reflection as seen by TMI increased more than 100-fold during the 11-minute flare.

TRMM – University of Utah

- The University of Utah's TRMM webpage displays an in depth list of the top 100 heavy rainfall events, thunderstorms, and tower clouds recorded by TRMM (includes snapshots)
- MCSs can also be searched for with a variety of parameters, resulting in a list of results with data, snapshots, and a link to google it
- Data can also be downloaded

Heavy Rainfall
Thunderstorms
Tower Clouds

MCSs

Publications

Data download

Related Links

TRMM
GPM
JAXA
PPS
TSDIS

Rainfall Data Links

TRMM data
Real time 3B42
GPI
GPCP
GPCC

This project is supported
by NASA Grant
NNX08AK28G under
PPS



Heavy Rainfall

There are many ways to define heavy rainfall events. Here during the past decade (1998-2007). These rainfall events large raining areas. Over tropical oceans, many such case Mesoscale Convective Systems (MCSs), especially over

Heavy rainfall events over different regions

Apparently, it is not fair to compare the rainfall from large MCSs over South America to the rain heavy rainfall events for different regions. Current plan is to show the top 10 (or more) heavy rain

Heavy rainfall events during different seasons

Current plan is to show the top 10 (or more) heavy rainfall cases for each 10x10 degree box gl

Global Top100 event list / on google map

list of top 100 heavy rainfall events from TRMM - Google Chrome
http://trmm.chpc.utah.edu/strongest/heavyrainfall_top100_global_list.html

	orbit	longitude	latitude	date	time	Volume Rain	Echo top	MaxHt40	Min85PCT	Min37PCT	Area	Flashes	MinIR	snapshots
1	40197	127.18	30.16	20041203	23:12	2123417	9.38	5.00	206.2	258.0	294647	0	207.7	3d / 6 panels
2	7329	134.14	23.21	19990307	15:23	1871599	15.53	6.50	164.4	246.4	344977	5	201.8	3d / 6 panels
3	27512	-51.04	-31.26	20020912	3:42	1654584	13.57	11.50	134.9	217.2	255982	0	999.0	3d / 6 panels
4	6917	163.66	-5.62	19990209	12:58	1614155	16.61	6.25	149.5	248.5	224286	0	181.1	3d / 6 panels
5	46562	-61.74	-30.99	20060116	9:1	1587160	15.88	9.75	90.4	196.2	183211	504	186.3	3d / 6 panels
6	28254	-91.00	27.88	20021029	17:26	1573444	16.32	8.25	93.6	210.8	154314	74	186.1	3d / 6 panels
7	32904	-160.74	-24.04	20030824	2:22	1549648	18.45	4.25	190.6	258.0	382946	0	213.3	3d / 6 panels
8	54890	-159.58	-13.43	20070704	15:39	1536801	18.30	7.75	88.1	206.1	172954	27	180.9	3d / 6 panels
					16:									3d / 6 panels

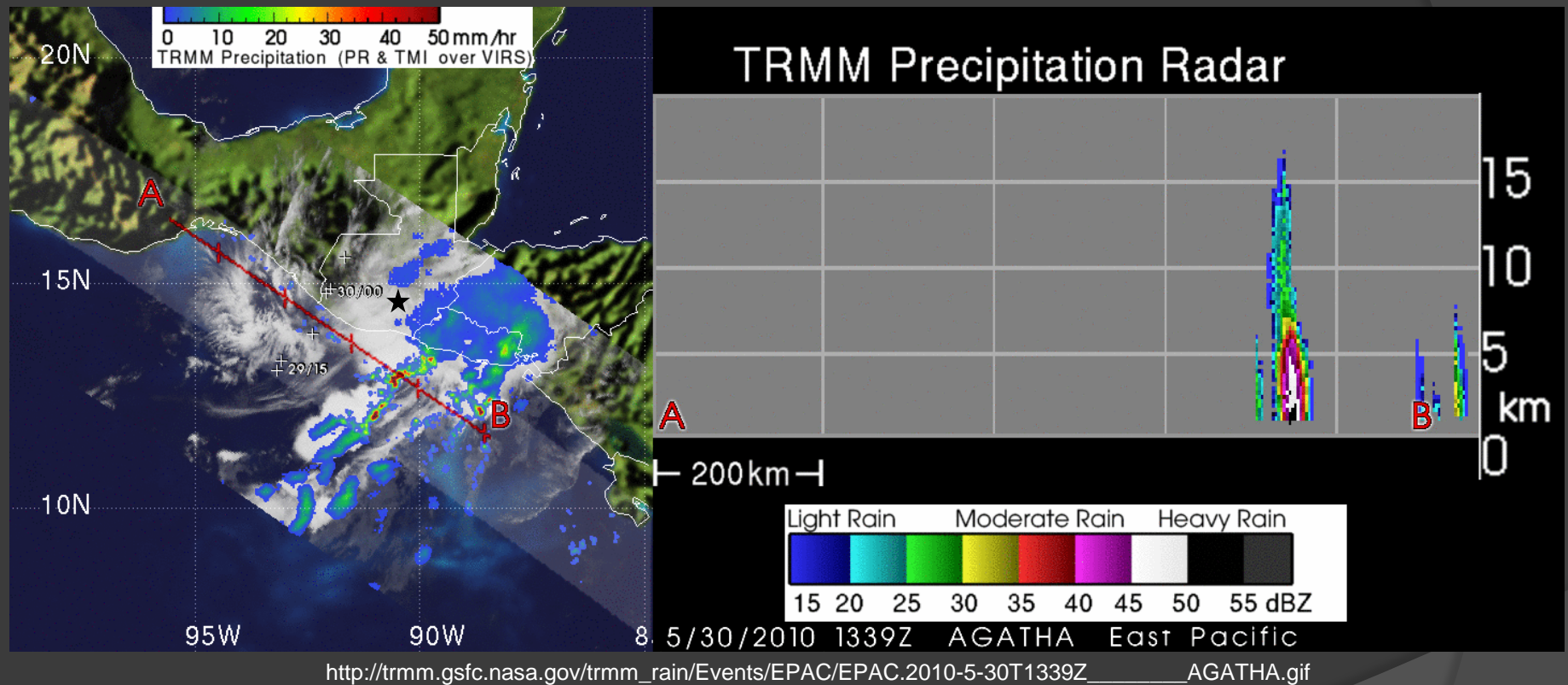
INVESTIGATING THE 2010 PACIFIC HURRICANE SEASON: TROPICAL STORM AGATHA

A Case Study

Background

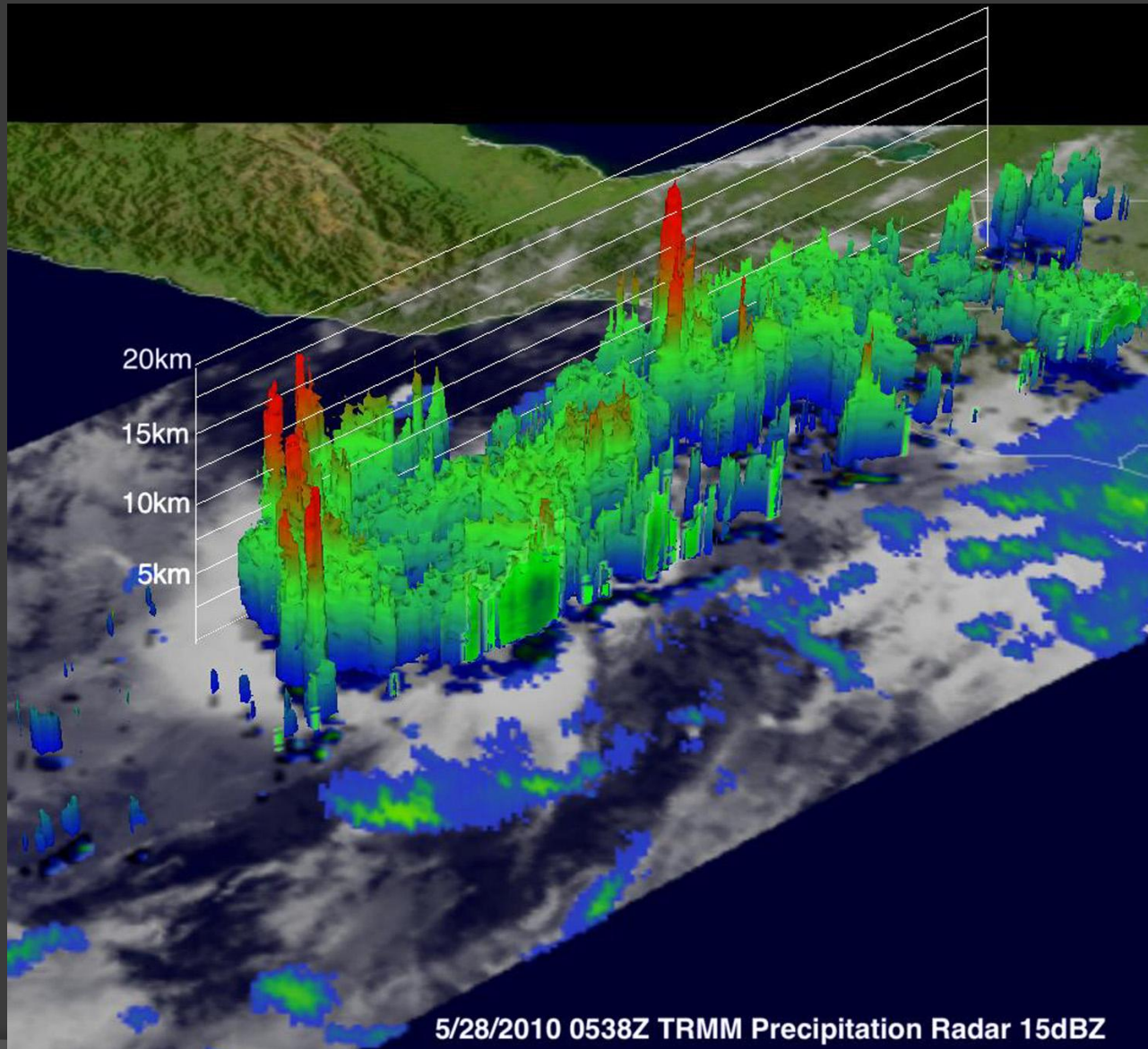
- First tropical storm of the 2010 Pacific season
- Originated in the Eastern Pacific near Central America
- Began on May 29th, and ended on May 30th
- Made landfall on Mexico-Guatemala border
- Agatha was a slow-moving system, which allowed for an excess of 20 in (510 mm) of rain to fall over El Salvador, Nicaragua, and Guatemala
- Heavy rainfall caused landslides and flooding which killed 180 people
- We will examine the affects that Agatha had on Guatemala using a variety of tools looking at TRMM precipitation data

Examining Guatemala: TRMM - NASA

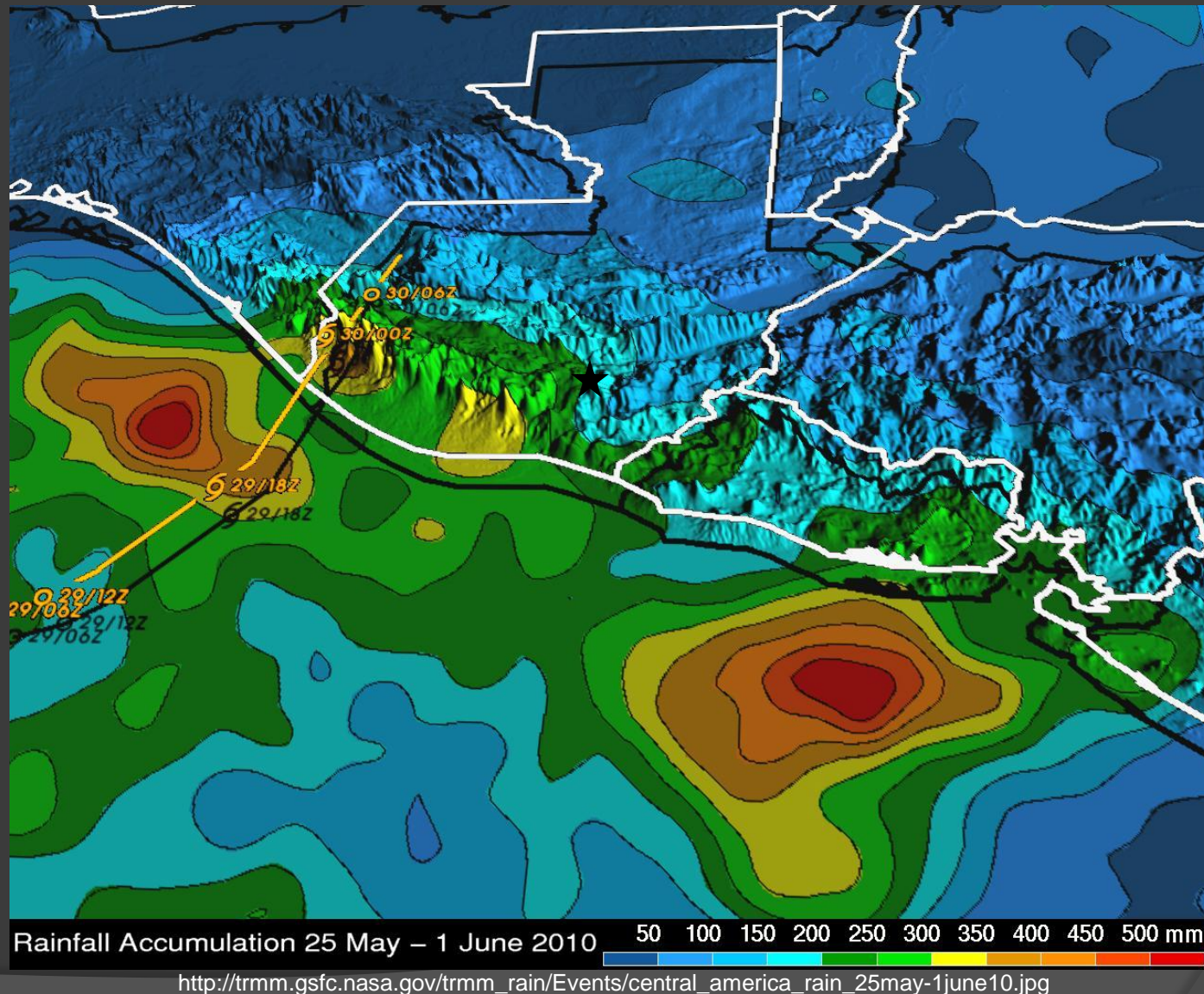


★ - Guatemala City

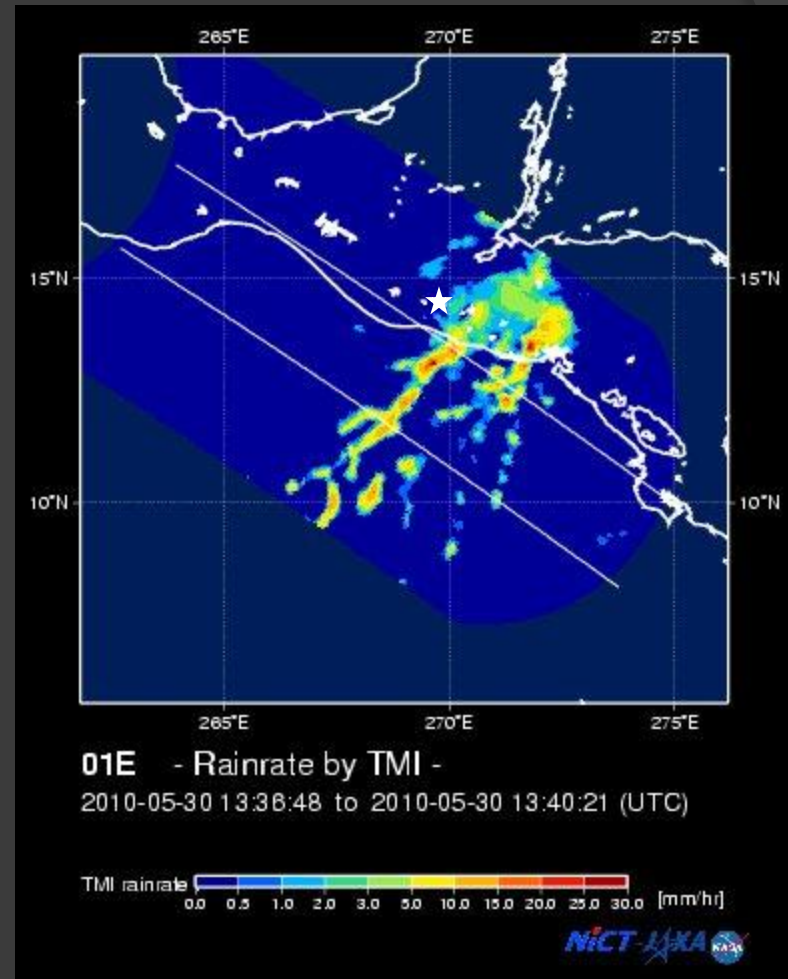
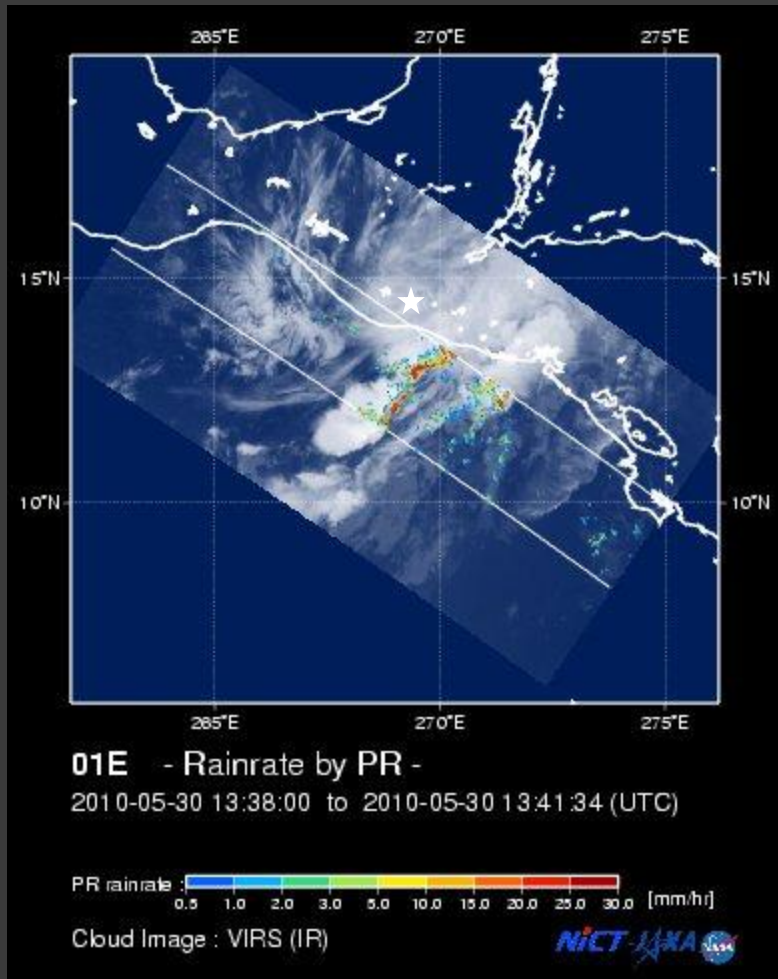
Examining Guatemala: TRMM - NASA



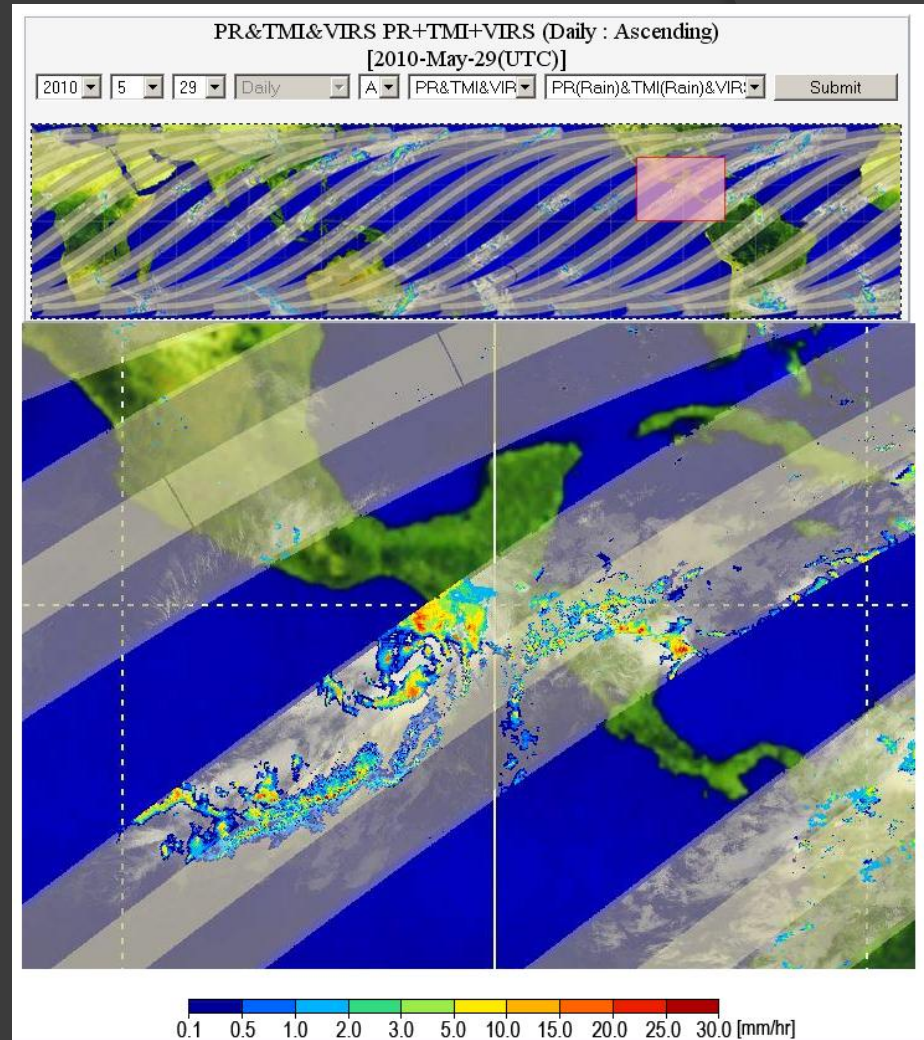
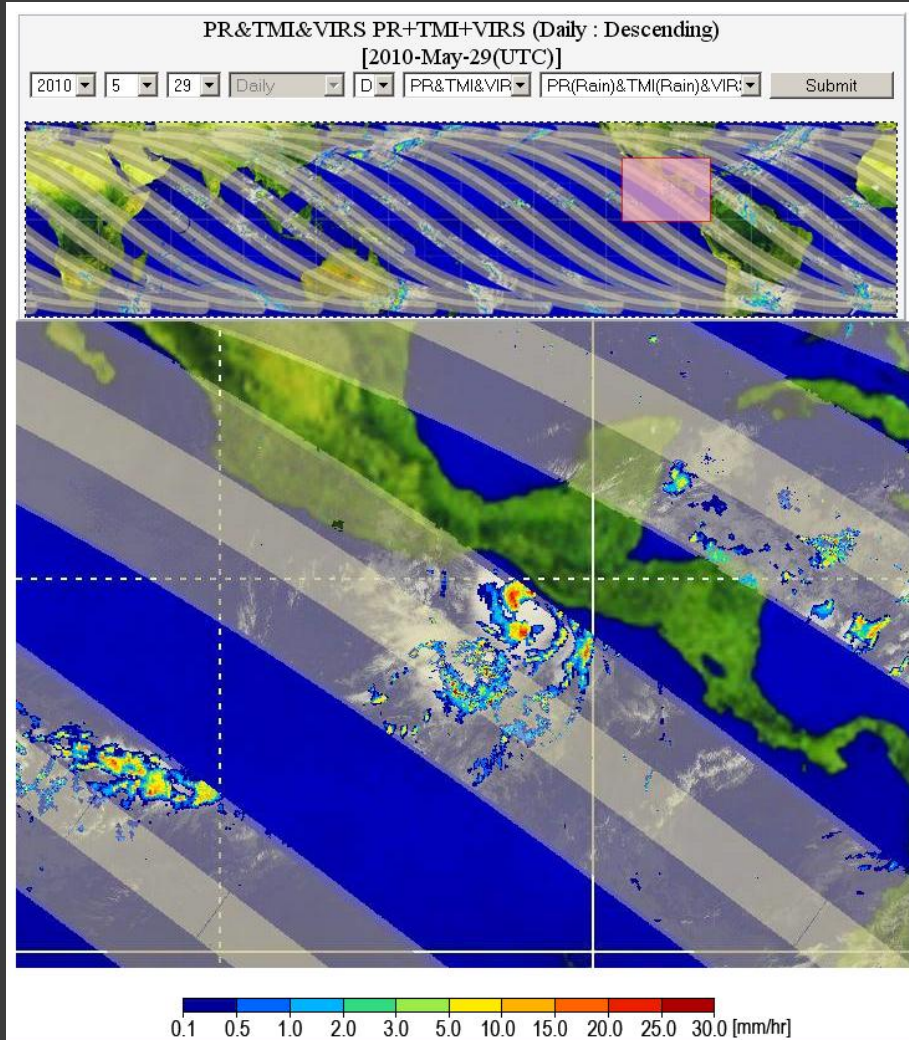
Examining Guatemala: TRMM - NASA



Examining Guatemala: TRMM - JAXA



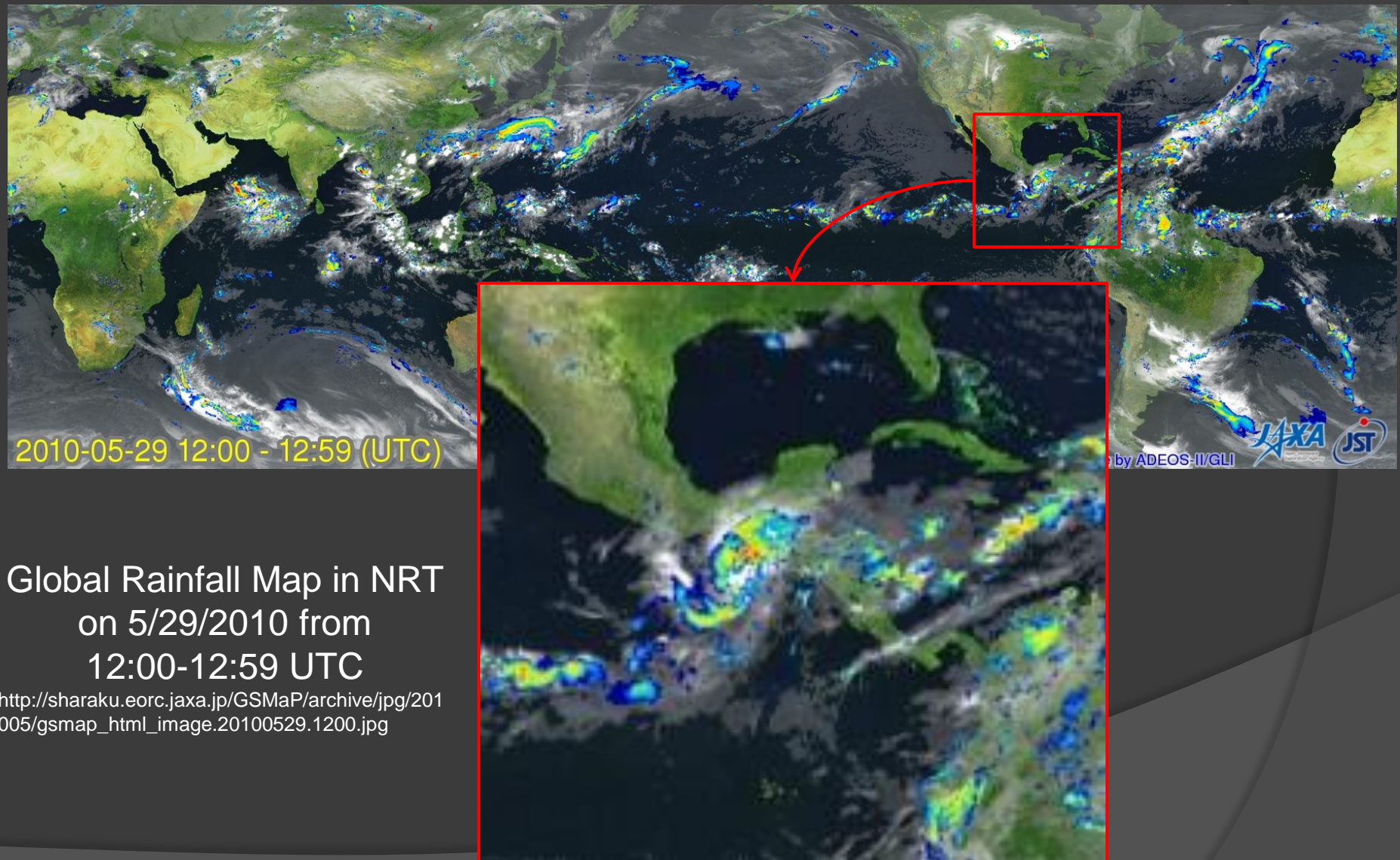
Examining Guatemala: TRMM - JAXA



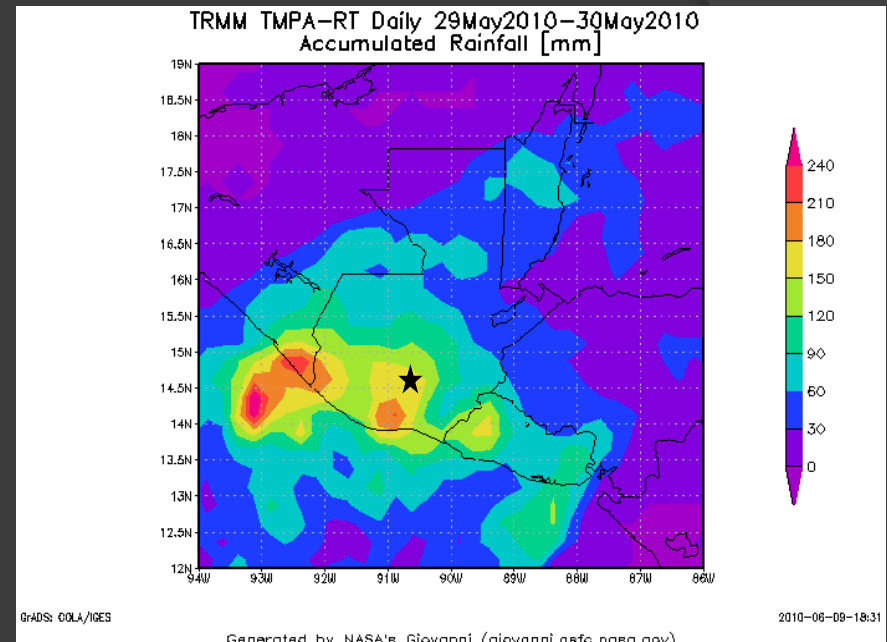
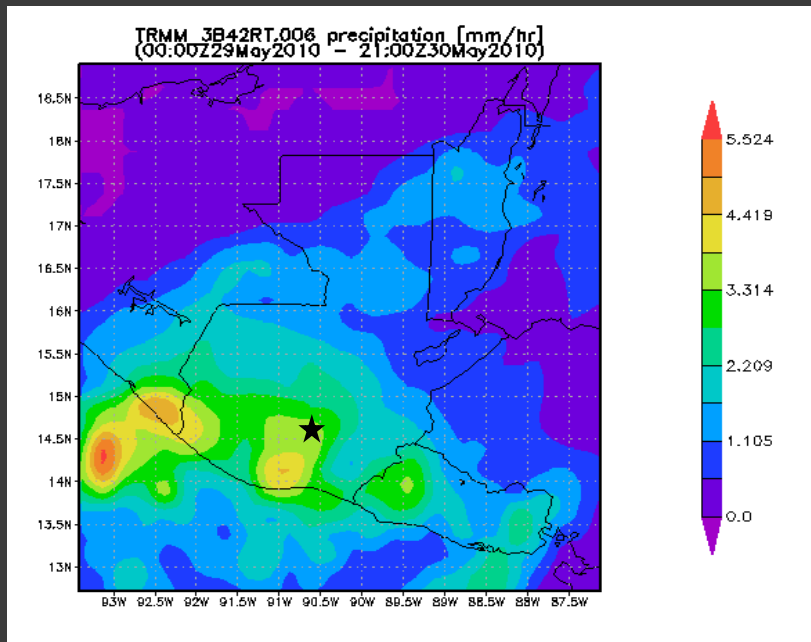
TRMM Real-Time images from 5/29/2010

http://sharaku.eorc.jaxa.jp/trmm/RT/index_e.html

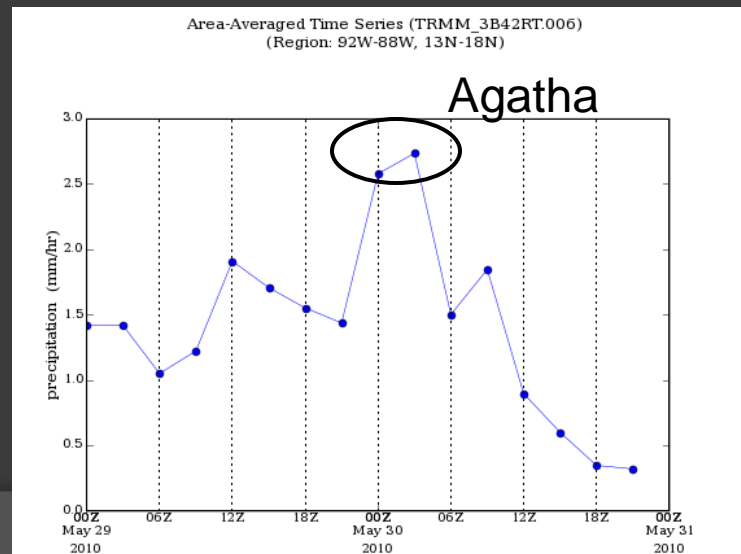
Examining Guatemala: TRMM - JAXA



Examining Guatemala: GIOVANNI

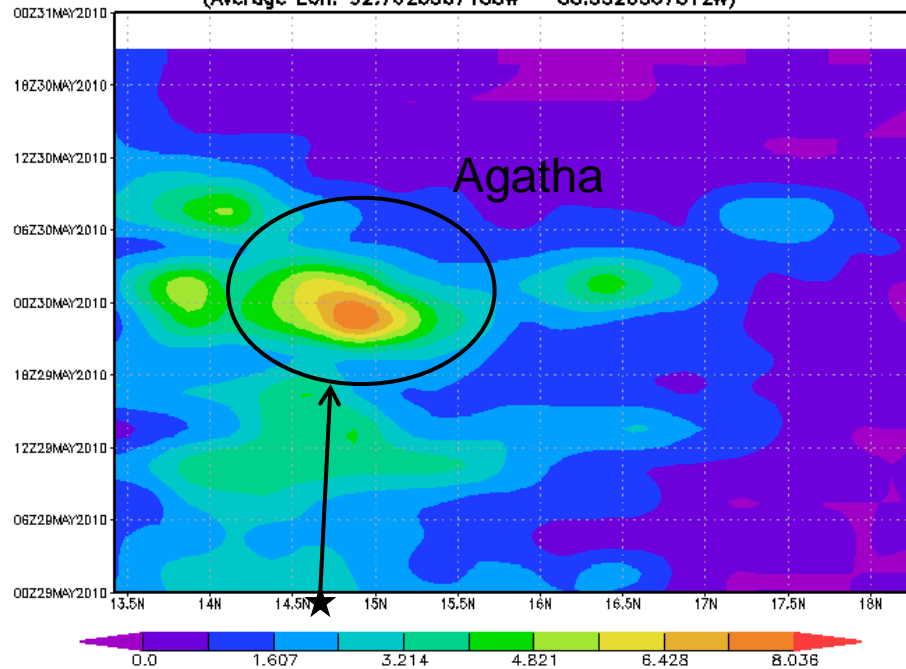


All images
generated with
GIOVANNI TOVAS
[http://disc2.nascom
.nasa.gov/Giovanni/
tovas/](http://disc2.nascom.nasa.gov/Giovanni/tovas/)

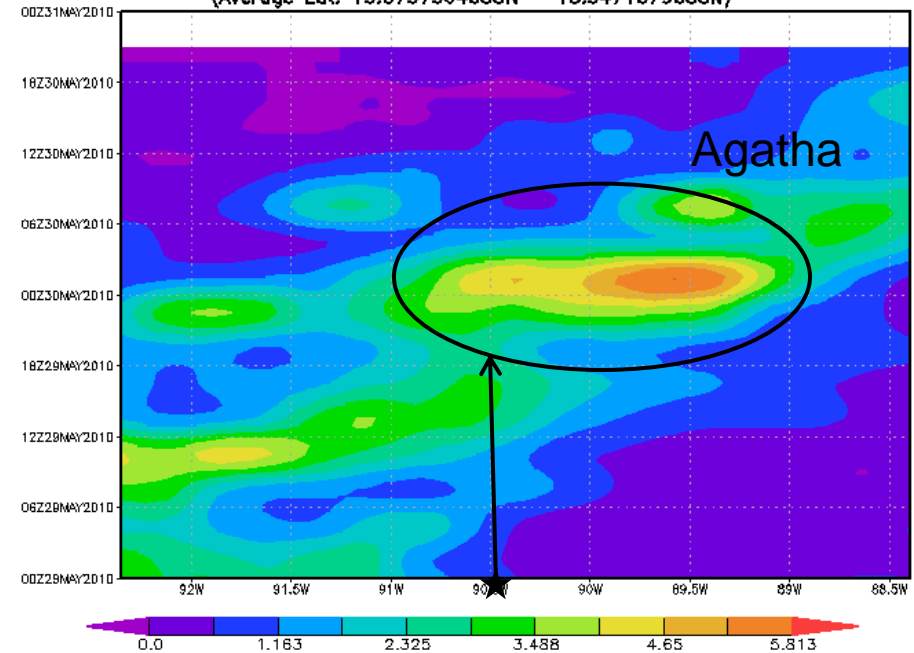


Examining Guatemala: GIOVANNI

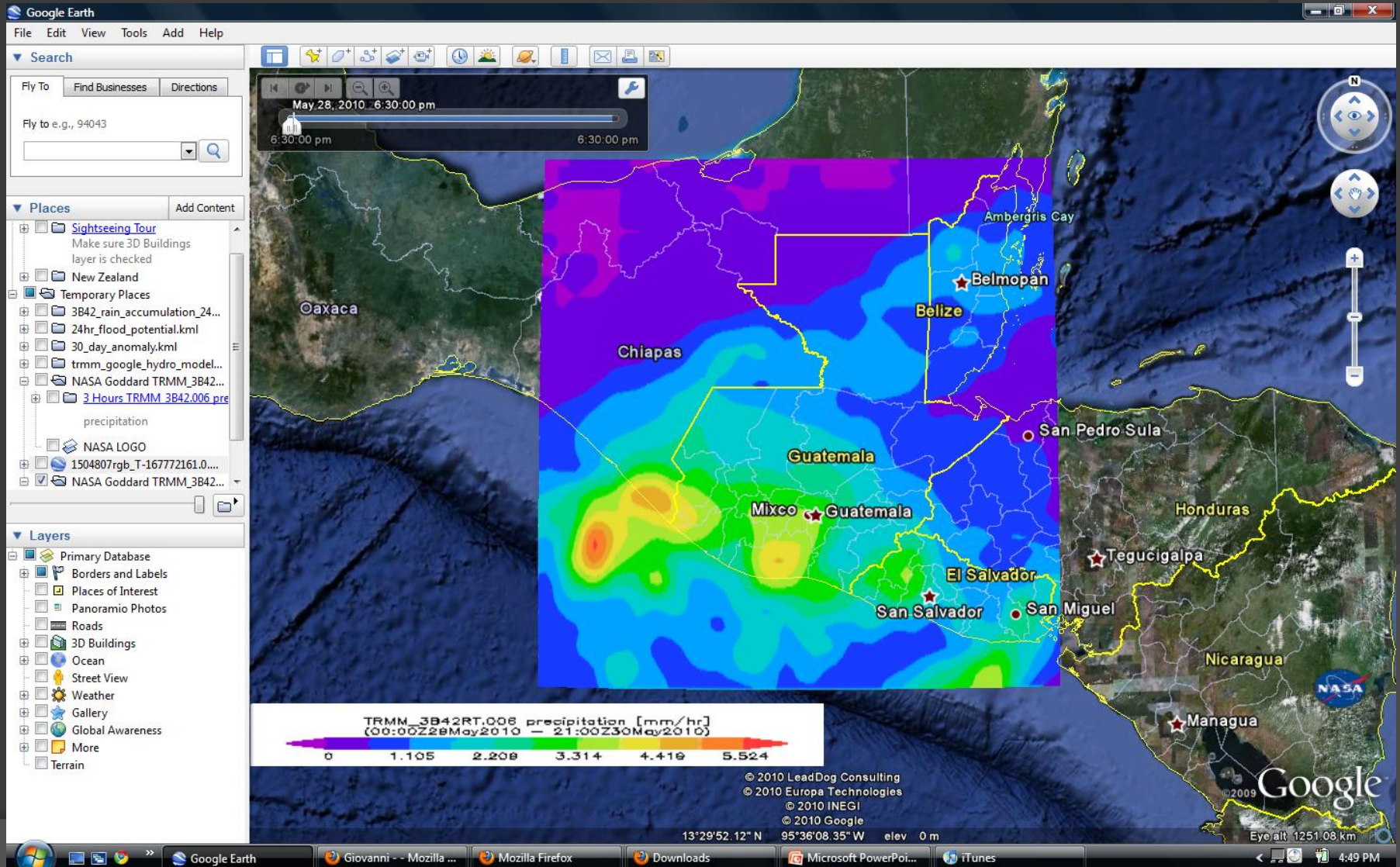
TRMM_3B42RT.006 precipitation [mm/hr]
(Average Lon: 92.7026367188W - 88.3520507812W)



TRMM_3B42RT.006 precipitation [mm/hr]
(Average Lat: 13.0737304688N - 18.3471679688N)

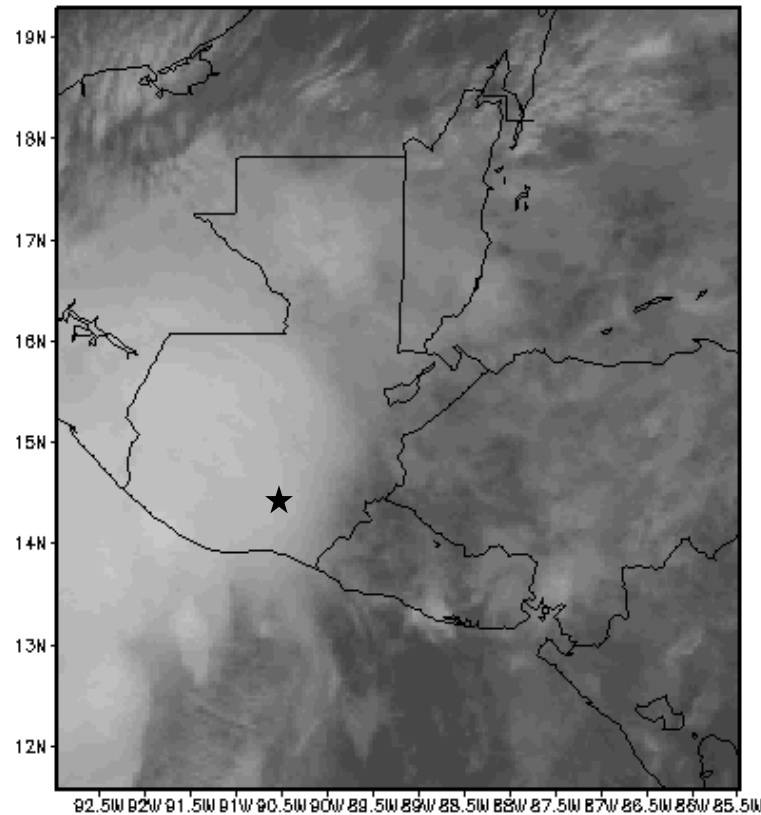


Examining Guatemala: GIOVANNI in Google Earth

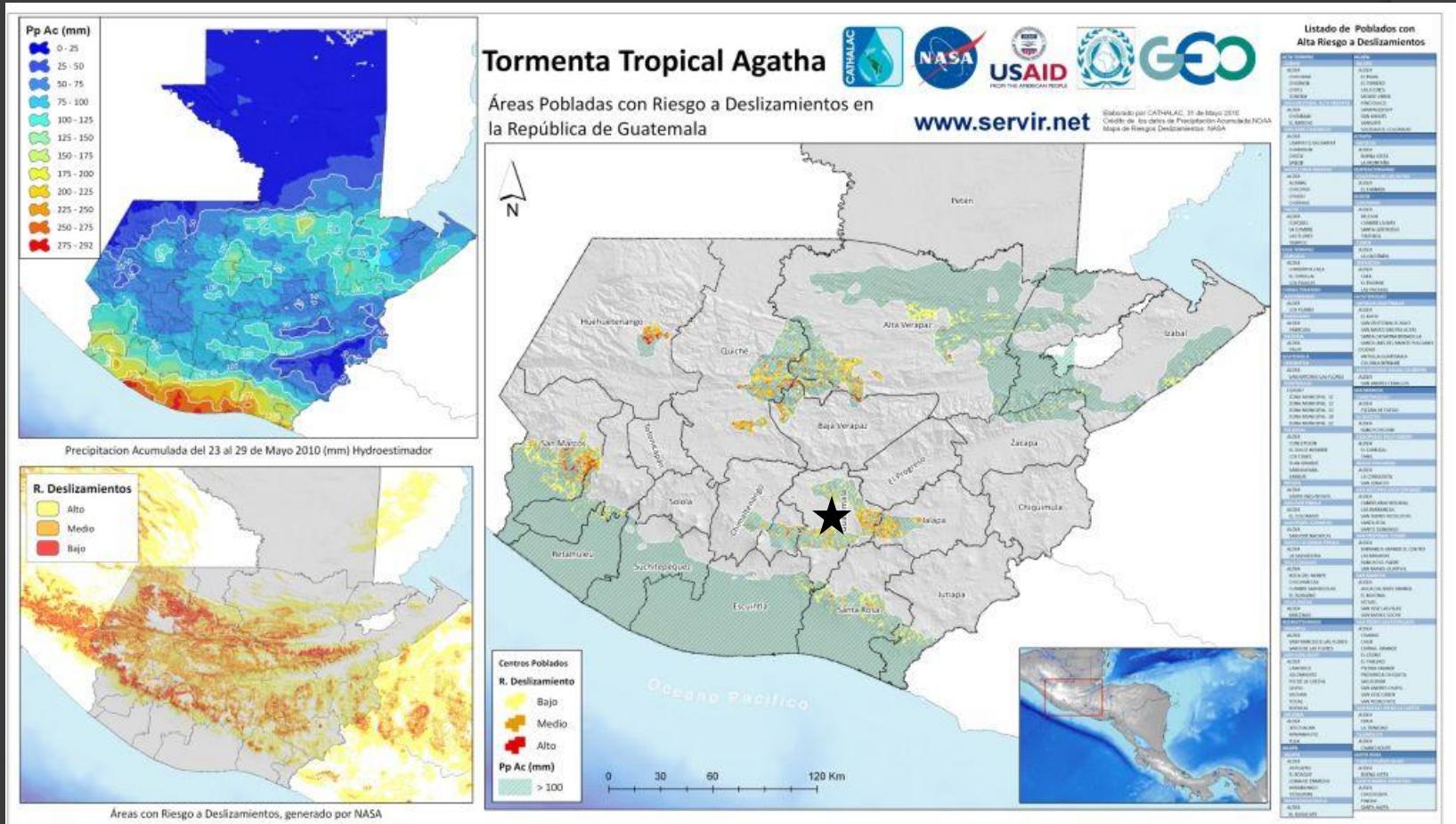


Examining Guatemala: Hurricane Analysis Tool

Global Merged IR (00min12Z29MAY2010)
Created by NASA Goddard GES DISC



Examining Guatemala: SERVIR



Areas at risk for landslides 5/29

http://www.servir.net/tormenta_tropical_agatha_mayo_2010

Examining Guatemala: SERVIR

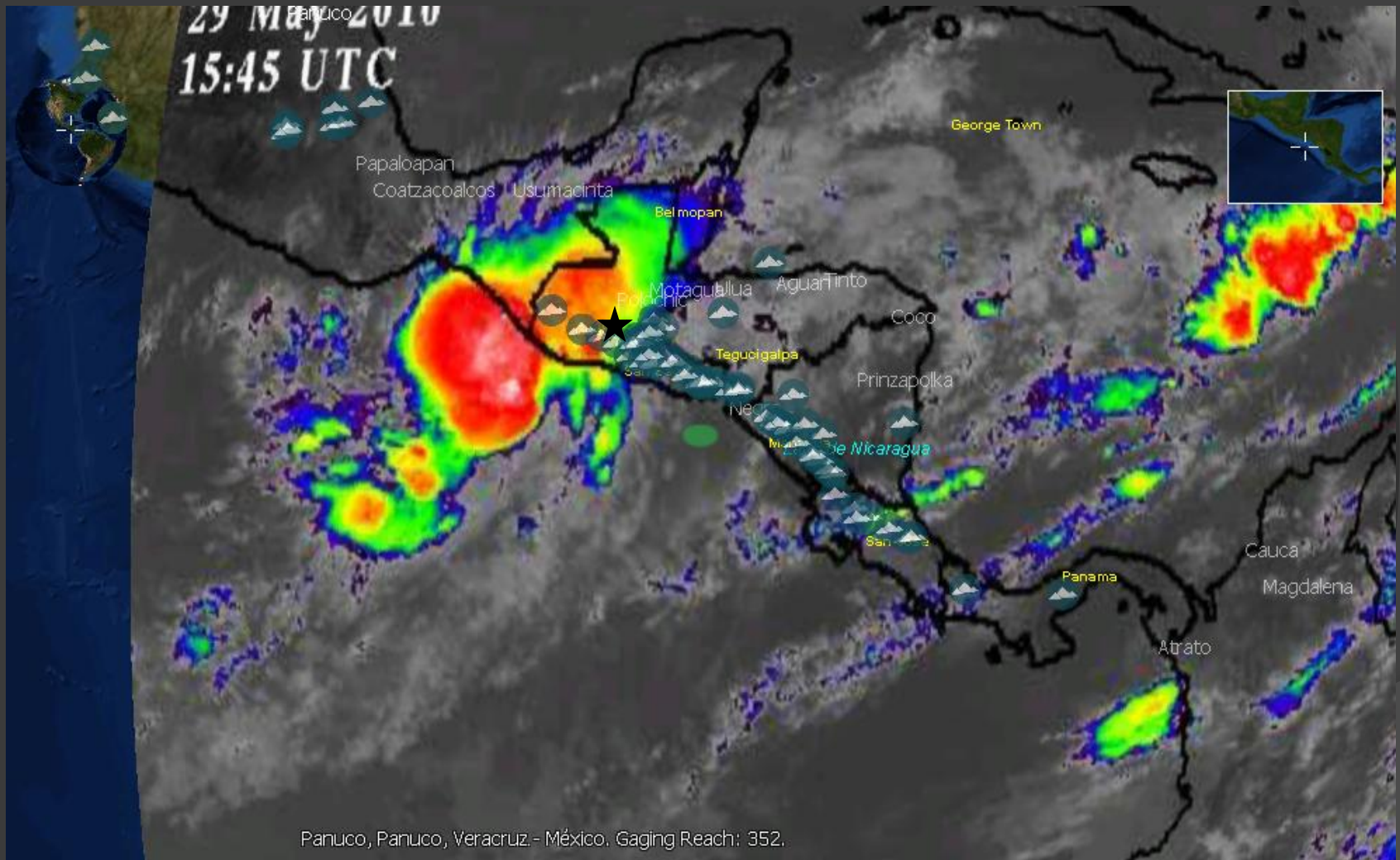


Image generated from SERVIR Viz, 5/29/10 at 15:45 UTC
Infrared, volcano locations, and earthquake shown

Analysis

- Heavy rainfall was evident in Guatemala during Tropical Storm Agatha
- The area in and around Guatemala City had some of the highest accumulated rainfall values, and some of the highest rainfall rates



<http://www.examiner.com/x-23333-Atlantic-Hurricanes-Examiner-y2010m5d31-Tropical-Storm-Agatha-kills-99-in-Central-America-photos>

- The heavy precipitation caused high landslide risks, followed by actual landslides, flooding, and...

Guatemala City: May 31, 2010

